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LEED and Historic Preservation:
A Study of USGBC's LEED Rating System for New Construction and Major Renovations as it Pertains to Historic Building Renovations

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LEED and Historic Preservation:
A Study of USGBC's LEED Rating System for New Construction and Major Renovations as it Pertains to Historic Building Renovations

by

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Thesis

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Dedication

This thesis is dedicated to my husband and children, for their immense love, patience and support, and to my parents, for instilling in me the love of learning and the constant desire for higher achievements.

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Abstract

LEED and Historic Preservation: A Study of USGBC's LEED Rating System for New Construction and Major Renovations as it Pertains to Historic Building Renovations

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The University of Texas at Austin, 2012

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This thesis discusses the United States Green Building Council's proposed changes in the LEED® (Leadership in Energy and Environmental Design) Rating System for New Construction and Major Renovations from the current 2009 version to the proposed 2012 version, as they pertain to historic building renovation projects. The comparison is aimed at determining whether the proposed changes to the rating system are becoming more favorable to historic preservation, promoting the rehabilitation and reuse of historic buildings as environmentally responsible practices. The discussion is taken a step further by proposing potential modifications and metrics that could be implemented into the LEED® Rating System in order to help advance historic preservation by recognizing the many inherent sustainable qualities of historic buildings, such as regional climate-adaptive features, durable materials and skilled craftsmanship.

The upcoming renovation of Battle Hall and West Mall Building, two buildings that are part of the School of Architecture complex at the University of Texas at Austin, serves as case study of historic buildings undergoing major renovations to which both the LEED 2009 and LEED 2012 Draft Rating Systems for New Construction and Major Renovations are applied. An analysis of the results informs the comparison between the two versions of the rating system.

The results of the comparison indicate that changes in the LEED® rating system for New Construction and Major Renovation from the 2009 to the 2012 version are favorable for historic preservation. The USGBC is advancing in the right direction with establishing more credits for historic preservation projects. The 2012 3rd Public Comment Draft rating system introduces the notion of "historic building" and that of "historic district" for the first time, in credits that address infill within a historic district and reuse of a historic building, with work performed in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties.* This represents a step forward toward integrating historic preservation and building reuse in the vocabulary of sustainability.

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Chapter I

INTRODUCTION

The idea for this thesis was born from the premise that historic preservation and adaptive reuse are inherently sustainable practices. Through the reuse of an existing historic building we are essentially recycling the entire building, thus reducing demand on the virgin natural resources that would be used to construct a new building, saving energy that would be used in the demolition and new construction process, and diverting waste from landfills by avoiding the demolition of the existing building. In a time dominated by issues of climate change and natural resource depletion, we cannot ignore the environmental benefits that reusing historic buildings can offer. Based on this premise, this thesis analyzes the LEED® (Leadership in Energy and Environmental Design) rating system, the construction industry's most widely recognized green building framework,[1] evaluating its use and applicability to historic building renovation projects.

The analysis focuses specifically on the comparison between the current LEED version 2009 rating system for New Construction and Major Renovations (LEED-NC v2009) and the proposed LEED version 2012 for New Construction and Major Renovations, projected to launch in November 2012,[2] through the lens of historic preservation. The intent of the comparison is to determine if the proposed changes in the rating system are becoming more favorable to historic preservation, and if they help promote the rehabilitation and reuse of historic buildings as environmentally responsible

[1] The LEED® green building certification program was established by the United States Green Building Council (USGBC) https://www.usgbc.org/

[2] The 2009 version of the LEED rating system is currently in effect. The 2012 3rd Public Comment Draft is the most recent draft to date of the proposed new version of the LEED rating system, issued by the USGBC.

practices and viable alternatives to demolition and new construction. To facilitate the comparison, the upcoming renovation project of Battle Hall and West Mall Building within the School of Architecture complex at the University of Texas at Austin serves as case study of historic buildings undergoing major renovations to which both the LEED-NC v2009 and the LEED 2012 3rd Public Comment Draft rating systems are applied in the context of this thesis.

The exercise of subjecting the Battle Hall and West Mall Building renovation project to the two different versions of the rating system enables a complete comparison of the two rating systems about a fixed reference point. Such comparison is not possible without considering both rating systems in their entirety, as the 2012 draft is drastically different than the 2009 version, and credits do not align between the two; consequently, comparing any part of one rating system to any part of the other rating system does not have sufficient corresponding parameters and is therefore unbalanced.

Through the aforementioned comparison and detailed analysis of results, an opinion can be developed as to whether the proposed new rating system is more suitable for use on historic buildings renovations seeking LEED certification. Findings of this investigation could help inform sustainable historic preservation practices at the University of Texas at Austin. With a campus core of nearly 50 historic buildings built prior to 1960,[3] it is important that the University establish standards for treatment of these buildings, as well as identify, evaluate and potentially reinstate sustainable and climate-adaptive features that the buildings may already possess, prior to undertaking more invasive modifications that could compromise the historic integrity of the buildings.

[3] The University of Texas at Austin, A Catalog of Historic and Significant Campus Interiors (Project Management and Construction Services, 2010), 3.

THE BATTLE HALL AND WEST MALL BUILDING RENOVATION PROJECT

Battle Hall, designed by New York architect Cass Gilbert and completed in 1911 as the campus library, is a historically significant building that was placed on the National Register of Historic Places in 1970. It is currently home to the Architecture and Planning Library, the Alexander Architectural Archives, and the Center for American Architecture and Design. In 1961 West Mall Building, housing classrooms and faculty offices, was attached to Battle Hall without an interior connection and without respect to aligning floor levels between the two buildings.

The proposed Battle Hall and West Mall Building renovation project includes reconfiguring interior spaces, creating a connection between the two buildings that would mitigate floor level differences, and addressing accessibility, structural and maintenance issues. Most of the historic interior fabric of Battle Hall will be retained and restored; the majority of interior modifications in the project will occur within West Mall Building, due to a lack of constraints derived from West Mall Building's non-historic interiors. The exteriors of both buildings will be preserved and repaired as needed, improving energy efficiency of the building envelope; exceptions are potential modifications to exterior doors as required for accessibility, as well as proposed additions to the south side of West Mall Building and Battle Hall which will expand over an area currently occupied by a loading dock and loading zone parking.[4] A full-height (six-story) addition will add approximately 25% in area to each floor of West Mall Building, while a two-story addition to Battle Hall will also add approximately 25% in area per floor, but to the sub-basement and basement levels only, with the basement level addition being the only visible portion above ground at the south side of Battle Hall.[5, 6, 7] Exterior materials for

[4] The University of Texas at Austin, Basis of Design – Draft: Battle Hall Complex – West Mall Office Building Renovation (Office of Facilities Planning and Construction, 2011)
[5] Parsons, Battle Hall and West Mall Building, Feasibility Draft, 2011;

the addition will be compatible with existing Battle Hall and West Mall Building exterior materials, with stone and brick being appropriate materials to use. A green roof is contemplated over the addition to Battle Hall.[8]

The University of Texas at Austin is considering LEED certification at the highest level attainable for the Battle Hall and West Mall Building renovation project under the LEED 2009 for New Construction and Major Renovations Rating System. However, depending upon the timing of the project start, with the 2012 version of the rating system being projected to launch in November 2012, it is likely that the Battle Hall and West Mall Building renovation project may register under LEED 2012 rather than 2009. The University's pursuit of LEED certification is not merely a means to achieve points, but rather a response to the University's sustainability policy and the goals and objectives of the School of Architecture. The Battle Hall and West Mall Building renovation project is intended to serve as a model of integrating sustainability and preservation, and it is suitable that School of Architecture buildings pave the way in this regard.[9]

Some specific sustainability goals addressed in the Owner's Project Requirements for the Battle Hall and West Mall Building renovation project include:

- Restore operability to the Battle Hall reading room windows as to allow natural ventilation, in addition to natural daylight;
- Complete HVAC replacement in both buildings;
- Strive to achieve energy efficiency of 30% above ASHRAE 90.1 criteria;

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[6] The University of Texas at Austin, Record Drawings: Battle Hall (Project Management and Construction Services, 2002-2009)

[7] The University of Texas at Austin, Record Drawings: West Mall Building (Project Management and Construction Services, 2002-2011)

[8] UT Austin, Basis of Design

[9] The University of Texas at Austin, Owner's Project Requirements: Battle Hall Complex – West Mall Office Building Renovation Study (2011)

- Perform ongoing monitoring of building systems;
- Install occupancy sensors for lights;
- Increase storm water run-off quality while decreasing quantity;
- Install native, adapted and xeriscape-type plant material, while eliminating turf where possible, to reduce the need for irrigation;
- Do not use reclaimed water inside the building or for green roof irrigation;
- Implement Integrated Pest Management (IPM) techniques.[10]

THE COMMON GOALS OF HISTORIC PRESERVATION AND SUSTAINABLE DESIGN

There are countless reasons why our historic building stock is worth reusing. Many of the design techniques that the green building industry celebrates today are the very same techniques that historic buildings have employed for years, born out of vernacular traditions and regional climate-adaptive features, such as building orientation, daylight harvesting, sun shading, passive ventilation, regional materials and native vegetation. Historic buildings that were built prior to the advent of the automobile are often located in densely populated areas, easily walkable, with access to many services and public transportation, and without abundant parking. Historic buildings, especially those built in the pre-World War II period, were built for longevity, which is a sustainable quality in itself. Employing durable materials and sound craftsmanship, benefiting from regional materials capable of enduring the climate demands of the particular site, and built in ways that facilitate repair or replacement of various building components in order to prolong the life of the building, the reuse of historic buildings makes good economic and environmental sense.

[10] UT Austin, Owner's Project Requirements

These ideas are echoed by Jean Carroon, FAIA, in her recently published book titled *Sustainable Preservation: Greening Existing Buildings*.[11] In the book Carroon describes what makes a historic building green, while opening the chapter with the phrase coined by Carl Elefante, FAIA, "The greenest building is… one that is already built."[12] In support of Elefante's statement, Carroon offers the following examples addressing embodied energy, embodied carbon, durability, indigenous materials, repairability, passive survivability, long term flexibility and adaptability, transit-oriented design, and walkability:

- Embodied energy is the sum of all energy used to extract the raw materials, manufacture the building products, transport the materials and products to the building site, and assemble them; calculated according to a formula established in the 1970s for the Advisory Council on Historic Preservation, a typical 50,000 sf commercial building embodies approximately 80 billion Btu's of energy, which is approximately the equivalent of 640,000 gallons of gasoline (therefore tearing the building down would not only waste this energy, but more energy and more raw materials would then be consumed in order to construct a new building).
- Embodied carbon is defined as the amount of carbon emitted through building construction, including the life cycle of the material from extraction through manufacture, transportation and final assembly.
- The durability and low maintenance of materials and construction systems often used in historic buildings, such as masonry walls, slate roofs and

[11] Jean Carroon, FAIA, Sustainable Preservation: Greening Existing Buildings (Hoboken, NJ: John Wiley and Sons, Inc., 2010), 7-12

[12] Carl Elefante, FAIA, "The Greenest Building Is… One That Is Already Built." Forum Journal 21, no. 4 (Summer 2007): 26-38.

terrazzo floors, makes their use desirable from a sustainable design standpoint.

- Indigenous materials are likely to be found in the construction of older historic buildings; these materials are adapted to the climatic conditions of the area and therefore are more durable, while also having lower transportation costs and supporting local economies.
- Historic materials can often be repaired rather than replaced, lengthening the life of the material, which in turn contributes to lengthening the life of the building, reducing waste and employing local workers.
- Historic buildings often have large windows and small footprints, which can facilitate travel of natural light to the interior of the building, thus reducing the energy consumption of artificial lighting.
- Passive ventilation was often achieved in historic buildings built prior to the advent of the mechanical systems, with windows and doors placed to take advantage of prevailing breezes.
- Long term flexibility and adaptability or "Long Life/ Loose Fit" (reference Jean Carroon makes to another well-known term, coined by Stewart Brand[13]) refers to the concept that buildings should be made to last while at the same time being flexible to change; this is true of historic buildings which are generally adaptable to various uses.
- Transit-oriented design and walkability are characteristics of historic building sites, which were often located near public transportation and part of densely populated and walkable communities.[14]

[13] Stewart Brand, How Buildings Learn: What Happens After They're Built (New York: Viking, 1994)
[14] Carroon, 7-12

The growing awareness of the interconnection of historic preservation and sustainability in the context of the built environment has become more prevalent in recent years. The historic preservation movement has long hailed the inherent sustainable qualities of historic buildings, and the environmental benefits of building reuse over replacement through demolition and new construction. The green building industry has been somewhat slower to recognize these environmental benefits, but countless sustainable renovations all over the United States in recent years have demonstrated that historic buildings can be just as green and energy efficient as new buildings. In support of the synergistic relationship between historic preservation and sustainability, in 2011 the National Park Service produced "The Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines on Sustainability for Rehabilitating Historic Buildings," a document meant to replace the Energy Conservation chapter in its 1992 publication "The Secretary of the Interior's Standards for Rehabilitation & Illustrated Guidelines for Rehabilitating Historic Buildings."[15] The purpose of this guide is to reconcile inherent conflicts between the LEED Rating System and the Secretary of the Interior's Standards, especially in regards to practices such as window replacements and building envelope sealing in the name of energy savings, as well as the addition of green roofs and solar panels on historic buildings. Also in 2011, the National Trust for Historic Preservation issued the report titled "The Greenest Building: Quantifying the Environmental Value of Building Reuse," in which the authors offered the most comprehensive analysis to date of the potential reduction of environmental impact with building reuse, and concluded that "building reuse almost always yields fewer

[15] Anne E. Grimmer and others, The Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines on Sustainability for Rehabilitating Historic Buildings. (Washington, DC: U.S. Department of the Interiors, National Park Service, 2011). http://www.nps.gov/tps/standards/rehabilitation/sustainability-guidelines.pdf

environmental impacts than new construction when comparing buildings of similar size and functionality."[16]

To provide a context for these documents and the recent "sustainable preservation" movement, it is necessary to consider the beginning of the relationship between historic preservation and the United States Green Building Council (USGBC). In 2006 the National Trust for Historic Preservation created the Sustainable Preservation Coalition in partnership with other national organizations including the American Institute of Architects, the Association for Preservation Technology International, National Park Service and National Conference of State Historic Preservation Officers. The Coalition's mission was to establish a dialogue with the USGBC regarding potential ways to modify the LEED rating system to better reflect the environmental benefits of reusing existing buildings. The USGBC's leadership was receptive to dialogue and in turn asked the Coalition to help the USGBC define standards of measurement for preservation to be used in the new version of the LEED rating system. Proposed modifications were agreed upon, and the Coalition advised the USGBC on revisions to be incorporated into the 2009 version of the LEED rating system. Some of the more notable revisions were weighted points awarded based on consideration of environmental impact (rather than each credit being awarded the same one point), which increased the total number of possible points from 69 to 110; and the addition of the Regional Priority bonus credit category, addressing specific factors pertinent to the project's geographic location.

[16] Preservation Green Lab, The Greenest Building: Quantifying the Environmental Value of Building Reuse (Washington, DC: National Trust for Historic Preservation, 2011) http://www.preservationnation.org/information-center/sustainable-communities/sustainability/green-lab/lca/The_Greenest_Building_lowres.pdf

The Sustainable Preservation Coalition continues to be involved in advising the USGBC on the LEED 2012 draft.[17]

THE USGBC AND THE EVOLUTION OF THE LEED® RATING SYSTEM

The LEED® green building certification system was first launched by the USGBC in 1998 in the form of a pilot program called LEED v1.0. Over the years, the LEED rating systems have evolved through several versions incorporating growing trends of the construction industry: the LEED Green Building Rating System v2.0 was released in 2000, LEED v2.1 in 2002, LEED v2.2 in 2005 and LEED v3 in 2009 (which became known simply as LEED 2009).[18] The 2009 version of the certification system will be in effect until the 2012 version is formally adopted. Currently there are ten distinct LEED rating systems in effect. The most commonly used and most widely-encompassing is LEED for New Construction and Major Renovations (LEED-NC). Additionally there are the following systems: LEED for Existing Buildings: Operations & Maintenance (LEED-EB: O&M), LEED for Commercial Interiors (LEED-CI), LEED for Core & Shell (LEED-CS), LEED for Schools (LEED-SCH), LEED for Retail (with two rating systems available, Retail: NC and Retail: CI), LEED for Healthcare (LEED-HC), LEED for Homes, and LEED for Neighborhood Development (LEED-ND).[19]

The next version of the LEED rating system, LEED 2012, has been drafted and has undergone three public comment periods. After each public comment period,

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[17] Barbara A. Campagna, AIA, "How Changes to LEED Will Benefit Existing and Historic Buildings," Forum News, National Trust for Historic Preservation XV, no. 2 (2008): 1-2, 6 http://www.preservationnation.org/magazine/2009/march-april/Forum_News-Campagna.pdf

[18] USGBC. LEED 2009 for New Construction and Major Renovations Rating System (Washington, DC: US Green Building Council, 2009) (Updated August 2011), xi-xii

[19] USGBC. "Rating Systems." http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222 (Accessed 4/08/2012)

comments were carefully evaluated and incorporated into a new draft, which was then re-issued and re-opened for public comment. The most recent draft is the LEED 2012 3rd Public Comment Draft, which this thesis discusses, and for which the public comment period ended on March 27, 2012. This was intended to be the last draft before voting on the changes; however due to the overwhelming response from the 3rd public comment period, the USGBC announced on April 16, 2012 that it will open a 4th public comment period between May 1 and May 15, 2012.[20] Concurrently with the 4th public comment period, the previously established timeline will stand with one modification: between April 2 and May 15, 2012 (extended from May 1 to properly account for the comments on the 4th public comment draft), employees of USGBC's national members in good standing may "opt-in" to vote by joining the Consensus Body; voting will be cast between June 1 and June 30, 2012; and the new 2012 LEED rating system is projected to launch in November 2012.[21]

The proposed 2012 version of the LEED certification system includes the following rating systems, of which some encompass several sub-systems, as listed below:

- Building Design and Construction (LEED BD+C)
    - New Construction
    - Core & Shell
    - Schools
    - Retail
    - Data Centers
    - Warehouse & Distribution Centers

[20] USGBC. "LEED 2012: Fourth Public Comment Period to Open May 1." http://www.usgbc.org/News/USGBCInTheNewsDetails.aspx?ID=4808 (Accessed 4/16/2012.)
[21] USGBC. "Dive Into LEED 2012." http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2360 (Accessed 4/27/2012)

    - Hospitality
    - Healthcare
- Interior Design and Construction (LEED ID+C)
    - Commercial Interiors
    - Retail
    - Hospitality
- Existing Buildings: Operations and Maintenance (LEED EB: O&M)
- Neighborhood Development (LEED-ND)
- Homes (LEED for Homes)
    - Homes (Single Family and Low-Rise Multifamily)
    - Mid-Rise (Multifamily).[22]

[22] USGBC. "LEED 2012 Changes by Rating Systems." http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2601 (Accessed 4/08/2012)

Chapter II

SELECTING A LEED RATING SYSTEM FOR THE HISTORIC RENOVATION PROJECT

As discussed in Chapter I, although there is not one LEED rating system designed specifically to address historic buildings, many of the existing LEED rating systems can be applied to a historic renovation project, depending on the type and the extent of the work. The USGBC publishes a Rating System Selection Guidance for each version of the LEED rating system, based upon which an informed selection can be made.

Based on the "LEED 2009 Rating System Selection Guidance," the methodology for selecting the rating system for the historic renovation project involves two steps: the first step is based upon the extent of the construction work to be performed, and the second step is based upon the space usage type.[23]

Based upon the scope and extent of the construction work, one would choose from the following categories:

- Complete Construction: includes new construction or major renovation projects, with a complete interior fit-out. Applicable rating systems for consideration are LEED for New Construction and Major Renovations, LEED for Schools, LEED for Healthcare, LEED for Retail: New Construction and Major Renovations, and LEED for Homes.
- Core and Shell Construction: includes projects undergoing new construction or major renovation on the exterior shell and core mechanical, electrical, and plumbing units only, without a complete interior fit-out. The only applicable rating system is LEED for Core and Shell.

[23] USGBC. "LEED 2009 Rating System Selection Guidance." Version 4. Last Updated September 2011. http://www.usgbc.org/ShowFile.aspx?DocumentID=6667.

- Commercial Interior Construction: includes commercial interior spaces that are undergoing a complete interior fit-out of at least 60% of the certifying gross floor area. Applicable rating systems for consideration are LEED for Commercial Interiors and LEED for Retail: Commercial Interiors.
- Existing Buildings: Limited Construction: pertains to existing buildings undergoing improvement work with little to no construction. The only applicable rating system is LEED for Existing Buildings: Operations and Maintenance.[24]

Based on usage type, there are some important considerations. If the project's primary function[25] is that of a K-12 school, the project must use the LEED for Schools rating system; similarly if the project's primary function is healthcare-related, the project must use the LEED for Healthcare rating system. Both of these rating systems have requisite criteria specific to that particular use. Any project that is not primarily a K-12 school, retail or healthcare may use the LEED for New Construction and Major Renovations rating system. A retail project would use either LEED for Retail: New Construction and Major Renovations or LEED for Retail: Commercial Interiors, depending on whether the extent of work aligns with "new construction or major renovation with a complete interior fit-out," or with "complete interior fit-out of at least 60% of gross floor area." Thus the LEED for Commercial Interiors rating can be applied to any interiors projects that do not primarily serve a retail function. Lastly, the LEED for Homes rating system would be applicable to low-rise residential projects (1-3 stories),

[24] USGBC. "LEED 2009 Rating System Selection Guidance."
[25] More than 75% of spaces have that function.

while the LEED for Homes Multi-Family Mid-rise would be applicable for mid-rise residential projects (4-6 stories).[26]

Applying the methodology described above to the Battle Hall and West Mall Building renovation project, based upon the extent of work described in Chapter I which aligns with the "Complete Construction" category, and based upon the usage type which is not a K-12 school, healthcare or retail project, the only rating system that is applicable to the project is LEED for New Construction and Major Renovations.

LEED-NC v2009 AND ITS APPLICABILITY TO HISTORIC PRESERVATION

In order to assess the applicability and effects of LEED-NC v2009 on historic building projects in the United States, it is helpful to look at historic building precedents that have undergone sustainable renovations earning certification under LEED-NC v2009. However, extensive searches for such projects have yielded few results, as only 241 projects were certified under LEED-NC v2009 in the US as of April 27, 2012.[27] The low number of certified projects is due to the length of time from LEED project registration to the end of construction and LEED certification, which from the author's experience is an average of three years. LEED 2009 (or LEED v3) became effective three years ago, on April 27, 2009, and starting on June 27, 2009, new projects seeking LEED certification were required to register under LEED 2009.[28] The 241 certified projects have been recently finished and certified, and the number is expected to grow, as the great majority of projects begun under the LEED-NC v2009 rating system are still

[26] USGBC. "LEED 2009 Rating System Selection Guidance."
[27] USGBC. "LEED Projects and Case Studies Directory: Certified Project Directory." http://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx (Accessed April 27, 2012)
[28] USGBC. 2009. "LEED v3 Rollout." https://www.usgbc.org/ShowFile.aspx?DocumentID=5176 (Accessed 4/16/2012)

under construction or at various stages of the certification process. The LEED Registered Project Directory on the USGBC website listed 4540 projects registered for certification under LEED-NC v2009 as of April 27, 2012. [29]

It is difficult to determine how many of the 241 LEED-NC v2009 certified projects in the US are historic building renovations, because information regarding existing building age or historical significance, in the case of a renovation project, is currently not recorded by the USGBC. The only manner in which one could compile a comprehensive list of historic renovation projects that are LEED certified under LEED-NC v2009 is by taking each individual project name from USGBC's LEED Certified Project Directory and performing a search to determine if the project is a renovation as opposed to new construction, and if there is a historic building involved.

The LEED Certified Project Directory on the USGBC website currently has the following headings, with the possibility of filtering by each of them: Project Name, City, State, Country, LEED System, Case Study, Owner Organization, and Certification Level. It would be useful to the building industry were the USGBC to create an additional category heading, indicating at minimum whether the project is new construction or major renovation, since this rating system includes both, and a filter for the historical status of the existing building.[30] Additionally, the LEED Certified Project Directory provides case studies and project scorecards for LEED projects certified under prior versions of the various LEED rating systems, but such information is not yet available for

[29] USGBC. "LEED Projects and Case Studies Directory: Registered Project Directory." http://www.usgbc.org/LEED/Project/RegisteredProjectList.aspx (Accessed April 27, 2012)

[30] Listed on the National Register of Historic Places; OR eligible for listing on the National Register of Historic Places; OR designated as a state or a local landmark by a state or local historic preservation review board; OR contributing building to a designated historic district; AND meeting the "historic age" of 50 years as established by the National Park Service.

projects certified under any of the 2009 LEED rating systems.[31] When that information does become available, it will be a valuable tool for the building industry, also enabling a more accurate analysis of how the LEED-NC v2009 rating system works on historic renovation projects.

Without access to such information, the author has compiled a list of historic projects that earned LEED certification under the LEED-NC v2009 rating system, serving to better inform the possibilities and limitations of applying the LEED-NC v2009 rating system to historic renovation projects. The following 11 projects have been identified as historic building renovation projects that achieved LEED certification under the LEED 2009 for New Construction and Major Renovations rating system (Table 1). The table has additional columns as compared to USGBC's Certified Project Directory, listing construction date and historical status of the original building.

[31] A note on the LEED Certified Project Directory webpage states that project detail and certification scorecard for LEED v3 projects is currently unavailable, but will be added soon.

Project Name	Original Bldg. Constr.	Historical Status[32]	City	State	Owner	Certif. Level
Blair Hall Renovation	1927	Eligible	Springfield	OH	Wittenberg University	Gold
Brewery Vivant	1915 w/ add. 1948	Eligible; In Historic District	Grand Rapids	MI	Brewery Vivant	Silver
Calvert Hall Renovation	1953	Eligible	San Antonio	TX	Trinity University	Gold
Seitz Center Renovation	Ca. 1850	Eligible	Fort Wayne	IN	Indiana Technical University	Gold
Lafayette Hall	1926	Eligible	Washington	DC	George Washington University	Gold
Horton Hall Renovation	1928	Eligible	Wahpeton	ND	North Dakota State College of Science	Certified
Roger H. Perry Hall	1859	Eligible	Burlington	VT	Champlain College	Platinum
Rosedale Cafe	1913	Eligible; In Historic District	Anna Maria Island	FL	Stewart Engineering	Platinum
Sears Cottage	1935	Eligible; In Historic District	Anna Maria Island	FL	Stewart Engineering	Platinum
Spink Pavilion Renovation	1929	Eligible	St. Louis	MO	Missouri Botanical Garden	Certified
Taylor Hall	1928	Eligible	Macon	GA	Wesleyan College	Gold

Table 1: Historic Building Renovation projects that achieved LEED-NC v2009 certification

[32] Listed on the National Register of Historic Places; OR eligible for listing on the National Register of Historic Places; OR designated as a state or a local landmark by a state or local historic preservation review board; OR contributing building to a designated historic district; AND meeting the "historic age" of 50 years as established by the National Park Service.

The methodology used in identifying these projects was the following:

- Filtered the list of LEED-NC v2009 certified projects in the US on USGBC's LEED Certified Project Directory by project names containing the words "Renovation," "Remodel" and "Rehabilitation"; the process yielded 11 results: 10 for "Renovations," one for "Remodel," and none for "Rehabilitation."
- Performed an online search of each of the 11 results; found five of the projects to be renovations of historic buildings, while of the remaining six, three were non-historic renovations (the existing building not being of historic age[33]) and three were not found due to the name in the LEED Certified Project Directory being composed of letter or number codes belonging to buildings in military or other governmental facilities.
- Scanned the entire list of 241 LEED-NC v2009 certified projects for names or functions that may reveal a former historic use, such as "armory," "barn," "cottage," "farm," "farmhouse," "house," "hall," "meetinghouse," as well as names such as "bakery," "café" and "restaurant," as these uses often find their way in historic buildings through adaptive reuse; searches of the respective project names found six additional historic building renovations, adding to a total of 11.

Of the list of 241 LEED-NC v2009 certified projects, a total of 74 have been investigated through online searches. Among the 74 there are 11 historic building renovations, representing roughly 15%, of which three earned LEED Platinum ratings, five LEED Gold ratings, one LEED Silver rating and two LEED certified ratings. These

[33] The National Park Service (NPS) considers "historic age" to be 50 years old, a rule established in 1948 by NPS historians.

numbers are expected to grow, as more projects are becoming certified under the current rating system. The LEED Certified Project Directory is growing at the rate of approximately one project per day, having added 23 projects in 21 days from April 6 to April 27, 2012 (from 218 to 241 projects).[34] The number of registered projects is growing at an ever faster pace, as 101 projects have been registered in the 21 day period from April 6 to April 27, 2012 (from 4439 to 4540 projects).[35]

These results demonstrate that it is possible for historic building renovations to achieve high certification ratings under LEED-NC v2009. Furthermore, seven out of the 11 projects are buildings on higher education campuses, which are of particular interest for the Battle Hall and West Mall Building analysis, with six out of the seven buildings serving the same function post-renovation as prior to renovation (the seventh was adaptively reused). However, in order to actually measure the success of the rating system on historic building renovations it would be necessary to know how many historic buildings may have unsuccessfully attempted certification under LEED-NC v2009, and such information is not available at this time.

The detailed analysis of the Battle Hall and West Mall Building renovation project in Chapter III will supply further information on the applicability of specific credits to historic building renovation projects, as well as recommendations for possible improvements to the rating system to better serve historic building renovations undergoing LEED certification.

[34] USGBC. "LEED Projects and Case Studies Directory: Certified Project Directory."
[35] USGBC. "LEED Projects and Case Studies Directory: Registered Project Directory."

LEED-NC v2012 AND ITS APPLICABILITY TO HISTORIC PRESERVATION

The LEED 2009 for New Construction and Major Renovations rating system is comprised of 7 categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation in Design, and Regional Priority. Within these categories are a total of 8 prerequisites and 49 credits. All the prerequisites require mandatory compliance for LEED certification, and do not award points. The 49 credits, for which the point system is weighted to account for the environmental impact of the credit, award up to a total of 100 base points and 10 bonus points (the bonus points can be earned in The Innovation in Design and the Regional Priority categories).[36]

By comparison, the LEED 2012 3rd Public Comment Draft for New Construction and Major Renovations rating system is comprised of 8 categories (the same 7 categories from 2009 – with the exception that Innovation in Design is now simply called Innovation – and with the addition of the Location and Transportation category). There are 13 prerequisites and 41 credits in 2012, compared to 8 prerequisites and 49 credits in 2009. The total number of base points and bonus points is the same in both systems, but the credits and the point weighting systems are different.[37]

The following figures are intended to denote the changes and point distribution by category between the two versions of the rating system, with accompanying commentary on how the changes may affect historic building renovation projects. Potential opportunities for improvement in the rating systems, with the intent of better promoting the rehabilitation and reuse of historic buildings as environmentally responsible practices, are identified.

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[36] USGBC. LEED 2009 for New Construction and Major Renovations Rating System

[37] USGBC. "LEED Rating System 3rd Public Comment Draft for Building Design and Construction." Last modified February 2012. https://www.usgbc.org/ShowFile.aspx?DocumentID=18577

Integrative Process (IP)

			LEED 2012 for New Construction and Major Renovations			
			Project Checklist			
Y	?	N				
			Credit 1	Integrative Process		1

Figure 1: Integrative Process credit in USGBC's LEED 2012 for New Construction and Major Renovations

Credit: Integrative Process. This is a newly added credit in the 2012 draft; in the 2nd Public Comment Draft, this credit was part of an Integrative Process category; however, in the 3rd Public Comment Draft the category was eliminated and the credit alone was kept in unusual fashion outside of any category. The credit requirement is to implement a process in which the different disciplines on a project would collaborate in synergistic ways to inform decisions made at the Owner's Project Requirements (OPR), Basis of Design (BOD), Design Development and Construction Documents stages in order to achieve a high-performance design outcome. The analysis is required to include, at a minimum, energy and water-related systems, as well as cost analysis in reference to the energy and water-related systems. The documentation for this credit must demonstrate how the process influenced the design outcome.[38]

Commentary: Although well intentioned, the Integrative Process credit requires a tremendous amount of up-front work which appears disproportional with the single point that the credit offers. Because of this reason, it seems very likely that the credit may be one that design teams will not pursue. However, the integrative requirements between

[38] USGBC. LEED Rating System 3rd Public Comment Draft

various disciplines and building systems should be an essential part of the design process and should be pursued; therefore it may be more appropriate that this becomes a prerequisite rather than a credit.

Recommendation: Make Integrative Process a prerequisite to ensure compliance. Within this prerequisite there is a unique opportunity to introduce a provision requiring the design team to analyze the feasibility of adaptively reusing an existing building of comparable size, or one that would lend itself to be added on to if the size is not adequate; perform a detailed cost, energy and water-related systems comparison between the two options, that of building a new construction and that of adaptively reusing an already existing building. In addition to the synergistic analysis on energy, water systems and cost, the design team would be required to also perform calculations demonstrating the length of time it would take for the energy savings of the new energy efficient building to offset the cost of its demolition and construction.

Location and Transportation (LT)

LEED 2012 for New Construction and Major Renovations

Project Checklist

0	0	0	Location and Transportation	Possible Points:	16
Y			Prereq 1	Sensitive Land Protection	Required
			Credit 1	LEED for Neighborhood Development Location	5 to 16
			Credit 2	High Priority Site	2
			Credit 3	Surrounding Density and Diverse Uses	1 to 6
			Credit 4	Quality Transit	1 to 5
			Credit 5	Bicycle Network, Storage, and Shower Rooms	1
			Credit 6	Reduced Parking Footprint	1 to 2

Figure 2: Location and Transportation category in USGBC's LEED 2012 for New Construction and Major Renovations

The Location and Transportation category was newly introduced in the 2012 version of the rating system, incorporating some of the credits previously found in the Sustainable Sites category, and some credits adopted from the LEED for Neighborhood Development rating system, along with some new credits. An alternative compliance path for earning all 16 points in this category is to locate the project in a LEED for Neighborhood Development location.

Prerequisite: Sensitive Land Protection. This prerequisite in the 2012 3rd Public Comment Draft includes requirements from the Site Selection credit in the Sustainable Sites category of LEED-NC v2009, but by becoming a prerequisite it now mandates compliance. Because of mandatory compliance, the USGBC has introduced an option for "mitigation" of the impacts if development extends into the sensitive areas to be avoided (prime soils, flood hazard areas, threatened or endangered habitat, wetlands, and water bodies).[39]

Commentary: This is a commendable effort by the USGBC to further reduce the environmental impacts of development footprint and construction activities.

Recommendations: In this prerequisite there is a unique opportunity to reward historic rehabilitation and adaptive reuse projects. Case 1: Location on Previously Developed Land, which refers to locating development footprint on previously developed portions of the site, should also include adaptively reusing an existing historic building.

Credit: High Priority Site. This new credit in the 2012 3rd Public Comment Draft is essentially an expansion upon the Brownfield Redevelopment credit in the Sustainable Sites category of LEED-NC v2009. In addition to developing a brownfield site, this 2012 credit also awards 2 points for locating the project on a site with major

[39] USGBC. LEED Rating System 3rd Public Comment Draft

development constraints, one of the options being an infill location within a historic district.[40]

Commentary: This is one of the instances in the LEED 2012 3rd Public Comment Draft where the notion of "historic district" or "historic building" is introduced for the first time by the USGBC. The language of the credit itself does not define the term "historic district," but the USGBC website offers a glossary of terms for the LEED 2012 3rd Public Comment Draft on their website,[41] which will likely be added to the rating system when that is published. The definitions of "historic building" and "historic district" are accurately stated and easy to understand.

Recommendations: Along with developing an infill location within a historic district or a brownfield, the USGBC should also introduce, as part of the High Priority Site credit, the option of developing an existing historic building or existing building within a historic district.

[40] USGBC. LEED Rating System 3rd Public Comment Draft
[41] USGBC. "LEED 2012 3rd Public Comment Rating System Glossary." https://www.usgbc.org/ShowFile.aspx?DocumentID=18559 (Accessed April 29, 2012)

Sustainable Sites (SS)

LEED 2009 for New Construction and Major Renovations

Project Checklist

0	0	0	Sustainable Sites	Possible Points:	26
Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	Required
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	5
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation—Public Transportation Access	6
			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
			Credit 4.4	Alternative Transportation—Parking Capacity	2
			Credit 5.1	Site Development—Protect or Restore Habitat	1
			Credit 5.2	Site Development—Maximize Open Space	1
			Credit 6.1	Stormwater Design—Quantity Control	1
			Credit 6.2	Stormwater Design—Quality Control	1
			Credit 7.1	Heat Island Effect—Non-roof	1
			Credit 7.2	Heat Island Effect—Roof	1
			Credit 8	Light Pollution Reduction	1

Figure 3: Sustainable Sites category in USGBC's LEED 2009 for New Construction and Major Renovations

LEED 2012 for New Construction and Major Renovations

Project Checklist

0	0	0	Sustainable Sites	Possible Points:	10
Y			Prereq 1	Construction Activity Pollution Prevention	Required
			Credit 1	Site Assessment	1
			Credit 2	Site Development—Protect or Restore Habitat	1 to 2
			Credit 3	Site Development—Open Space	1
			Credit 4	Rainwater Management	1 to 3
			Credit 5	Heat Island Reduction	2
			Credit 6	Light Pollution Reduction	1

Figure 4: Sustainable Sites category in USGBC's LEED 2012 for New Construction and Major Renovations

The Sustainable Sites category in the LEED 2012 3rd Public Comment Draft for New Construction and Major Renovations is considerably smaller than the one in the 2009 version, as some of the credits have been moved to the newly introduced Location and Transportation category. Yet some other credits that were related have been combined into single credits with multiple options and multiple points. However the combined number of points for the 2012 Location and Transportation category (16 points) and Sustainable Sites category (10 points) equals the number of points of the LEED-NC v2009 Sustainable Sites category (26 points).

Credit: Site Assessment. This credit requires the completion of a site survey to include topography, hydrology, climate, vegetation, soils, human use, and human health impacts, in order to determine sustainable development options and better inform site design decisions.[42]

Commentary: The requirements of the Site Assessment credit are essential to a sound environmental and sustainable design, but just as with the Integrative Process credit, the amount of documentation required seems disproportional with the single point that the credit awards. Therefore it would be preferable that the USGBC make this a prerequisite rather than a credit, thus ensuring that design teams do consider holistically the impacts of their construction project over the environment and do make better informed sustainable design decisions.

Recommendations: Consider making Site Assessment a prerequisite in the LEED 2012 for New Construction and Major Renovations rating system. Also introduce an additional requirement under the "human use" assessment that, along with the

[42] USGBC. LEED Rating System 3rd Public Comment Draft

recycling/reuse of potential existing construction materials on the site, also evaluate the preservation/ rehabilitation/ reuse of existing buildings on the site.

Water Efficiency (WE)

			LEED 2009 for New Construction and Major Renovations			
			Project Checklist			
0	0	0	Water Efficiency		Possible Points:	10
Y			Prereq 1	Water Use Reduction—20% Reduction		Required
			Credit 1	Water Efficient Landscaping		2 to 4
			Credit 2	Innovative Wastewater Technologies		2
			Credit 3	Water Use Reduction		2 to 4

Figure 5: Water Efficiency category in USGBC's LEED 2009 for New Construction and Major Renovations

			LEED 2012 for New Construction and Major Renovations			
			Project Checklist			
0	0	0	Water Efficiency		Possible Points:	11
Y			Prereq 1	Outdoor Water Use Reduction		Required
Y			Prereq 2	Indoor Water Use Reduction		Required
Y			Prereq 3	Building-Level Water Metering		Required
			Credit 1	Outdoor Water Use Reduction		1 to 2
			Credit 2	Indoor Water Use Reduction		2 to 6
			Credit 3	Cooling Tower Water Use		1 to 2
			Credit 4	Water Metering		1

Figure 6: Water Efficiency category in USGBC's LEED 2012 for New Construction and Major Renovations

Changes to the Water Efficiency category include the addition of new prerequisites and more stringent water reduction requirements. Although these

requirements are commendable in what they are endeavoring to accomplish, it is unlikely that a historic building can achieve the high water reduction thresholds without removal of potential character defining features such as existing plumbing fixtures. The USGBC might consider an alternative compliance path for historic buildings. Alternatively, innovative ways to adapt historic plumbing fixtures to low flow aerators to reduce water consumption might be devised.

Energy and Atmosphere (EA)

			LEED 2009 for New Construction and Major Renovations		
			Project Checklist		
0	0	0	Energy and Atmosphere	Possible Points:	35
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Fundamental Refrigerant Management	Required
			Credit 1	Optimize Energy Performance	1 to 19
			Credit 2	On-Site Renewable Energy	1 to 7
			Credit 3	Enhanced Commissioning	2
			Credit 4	Enhanced Refrigerant Management	2
			Credit 5	Measurement and Verification	3
			Credit 6	Green Power	2

Figure 7: Energy and Atmosphere category in USGBC's LEED 2009 for New Construction and Major Renovations

			LEED 2012 for New Construction and Major Renovations		
			Project Checklist		
0	0	0	Energy and Atmosphere	Possible Points:	33
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
			Credit 1	Enhanced Commissioning	4 to 6
			Credit 2	Optimize Energy Performance	1 to 18
			Credit 3	Advanced Energy Metering	1
			Credit 4	Demand Response	1 to 2
			Credit 5	Renewable Energy Production	1 to 3
			Credit 6	Enhanced Refrigerant Management	1
			Credit 7	Green Power and Carbon Offsets	1 to 2

Figure 8: Energy and Atmosphere category in USGBC's LEED 2012 for New Construction and Major Renovations

Credit: Optimize Energy Performance. The primary change affecting historic building renovation projects in the Energy and Atmosphere category from the 2009 to the 2012 version of the LEED rating system for New Construction and Major Renovations is found in the percentage thresholds of the Optimize Energy Performance credit. This credit requires a percentage improvement in energy performance over a baseline building performance calculated according to ANSI/ASHRAE/IESNA 90.1-2010 Appendix G. For Major Renovation projects in both the 2009 and the 2012 versions the first point is earned for an 8% improvement over the baseline performance; from there in 2012 Major Renovation projects earn 1 point for each 1% improvement between 8% and 13%, followed by 1 point earned for each 2% improvement between 13% and 33%, and 1 point for each 3% improvement between 33% and 42%, for a maximum of 18 points. In 2009 Major Renovation projects earned 1 point for each 2% improvement over the baseline energy performance between 8% and 44%, for a maximum of 19 points.[43] [44]

Commentary: For a parallel comparison, in both the 2009 and the 2012 version, Major Renovation projects would earn 1 point for 8% improvement and 18 points for 42% improvement; however due to the manner in which percentages increase per point, in 2009 a Major Renovation project would earn 6 points for an 18% improvement over the baseline energy performance, compared to 2012 where a project would earn 6 points for a 13% improvement over the baseline energy performance. This 5% difference between the 2009 and the 2012 versions is significant, and remains consistent up to the point where a project would earn 14 points for a 34% improvement in 2009 compared to only a 29% improvement in 2012. From there the difference in percentage improvement

[43] USGBC. LEED Rating System 3rd Public Comment Draft
[44] USGBC. LEED 2009 for New Construction and Major Renovations Rating System.

tapers off for each additional point until it reaches the 18 points and 42% improvement which are the same for both the 2009 and the 2012 versions.[45] [46]

Recommendations: Even though under this credit historic building renovation projects would earn more points in the 2012 version of the LEED for New Construction and Major Renovation rating system as compared to the 2009 version, being perceived as more energy efficient, this still seems as an artificial way to measure the performance of an existing building. A more appropriate method for measurement for an existing building would be to use as baseline energy performance the building's actual performance prior to the renovation projects; a building could then earn points based on a percentage improvement over its actual baseline performance.

Materials and Resources (MR)

LEED 2009 for New Construction and Major Renovations

Project Checklist

0	0	0	Materials and Resources		Possible Points:	14
Y			Prereq 1	Storage and Collection of Recyclables		Required
			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof		1 to 3
			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements		1
			Credit 2	Construction Waste Management		1 to 2
			Credit 3	Materials Reuse		1 to 2
			Credit 4	Recycled Content		1 to 2
			Credit 5	Regional Materials		1 to 2
			Credit 6	Rapidly Renewable Materials		1
			Credit 7	Certified Wood		1

Figure 9: Materials and Resources category in USGBC's LEED 2009 for New Construction and Major Renovations

[45] USGBC. LEED Rating System 3rd Public Comment Draft
[46] USGBC. LEED 2009 for New Construction and Major Renovations Rating System

LEED 2012 for New Construction and Major Renovations

Project Checklist

0	0	0	Materials and Resources		Possible Points:	13
Y			Prereq 1	Storage and Collection of Recyclables		Required
Y			Prereq 2	Waste Management Planning		Required
			Credit 1	Building Reuse and Whole Building Life Cycle Assessment		1 to 4
			Credit 2	Material Life Cycle Disclosure and Assessment		1 to 2
			Credit 3	Responsible Extraction of Raw Materials		1 to 2
			Credit 4	Disclosure of Chemicals of Concern		1
			Credit 5	Avoidance of Chemicals of Concern		1 to 2
			Credit 6	Construction and Demolition Waste Management		1 to 2

Figure 10: Materials and Resources category in USGBC's LEED 2012 for New Construction and Major Renovations

Significant changes affecting historic buildings have been introduced in the Materials and Resources category of the 2012 3rd Public Comment Draft version of the LEED for New Construction and Major Renovations rating system. The two Building Reuse credits in the 2009 version, in which a building could earn up to 4 points for reusing certain percentages of existing envelope, structural elements, and interior non-structural elements, have been eliminated. The Materials Reuse credit, in which a building could earn up to 2 points for using salvaged, refurbished or reused materials, was also eliminated. Instead, the Building Reuse and Whole Building Life Cycle Assessment credit was introduced, which awards a maximum of 4 points. Other significant changes to credits in this category are the elimination of the Recycled Content and the Regional Materials credits, to be replaced by the Material Life Cycle Disclosure and Assessment credit. The Rapidly Renewable Materials and the Certified Wood credits have been completely removed, and not replaced by any reciprocal credits. New credits

introduced are: Responsible Extraction of Raw Materials, Disclosure of Chemicals of Concern, and Avoidance of Chemicals of Concern.[47]

Credit: Building Reuse and Whole Building Life Cycle Assessment. This credit has 5 options for compliance, but only one can be chosen and a maximum of only 4 points can be earned. The most important option for historic preservation is Option 1: Historic Building Reuse, where the maximum number of 4 points can be earned for reusing a historic building or a contributing building to a historic district, and rehabilitating it according to local or national standards, whichever are more stringent. Option 2: Renovation of Abandoned or Blighted Building also awards 4 points, but unfortunately both options cannot be used at the same time, despite the fact that often a historic building may also be abandoned or blighted. Option 3: Building and Material Reuse awards between 1-3 points for reusing or salvaging certain percentage thresholds of building materials found onsite or offsite; again this option cannot be used in conjunction with any of the other options in this credit, despite the fact that reusing an entire building does not preclude the reuse of salvaged materials found offsite or onsite. The remaining two options of this credit relate to Life Cycle Assessments (LCA), one being applicable to new construction projects only, and the other to projects involving building reuse with additions.[48]

Commentary: This credit is groundbreaking for historic preservation in the context of the LEED rating systems, since for the very first time a credit is introduced that specifically addresses the preservation, rehabilitation and reuse of historic buildings, and discourages the demolition of historic buildings. However, the 4 points that are offered for Historic Building Reuse or for Renovation of Abandoned or Blighted

[47] USGBC. LEED Rating System 3rd Public Comment Draft
[48] USGBC. LEED Rating System 3rd Public Comment Draft

Building still fall short of conveying the significance of the environmental advantages associated with building reuse, and still does not offer enough incentive to building owners and the development community to undertake such a project.

Recommendations: At minimum allow the concurrent application of more than one option within this credit, if more than one option is applicable to the historic building renovation project, and allow points to be earned cumulatively if more than one option is used. In the context of a weighted point system, where the number of points is awarded based on the level of environmental impact of the particular action, this would provide a more accurate representation of the benefic effects of building and materials reuse over the environment.

Indoor Environmental Quality (IEQ)

LEED 2009 for New Construction and Major Renovations

Project Checklist

0	0	0	Indoor Environmental Quality	Possible Points:	15
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
			Credit 1	Outdoor Air Delivery Monitoring	1
			Credit 2	Increased Ventilation	1
			Credit 3.1	Construction IAQ Management Plan—During Construction	1
			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
			Credit 5	Indoor Chemical and Pollutant Source Control	1
			Credit 6.1	Controllability of Systems—Lighting	1
			Credit 6.2	Controllability of Systems—Thermal Comfort	1
			Credit 7.1	Thermal Comfort—Design	1
			Credit 7.2	Thermal Comfort—Verification	1
			Credit 8.1	Daylight and Views—Daylight	1
			Credit 8.2	Daylight and Views—Views	1

Figure 11: Indoor Environmental Quality category in USGBC's LEED 2009 for New Construction and Major Renovations

LEED 2012 for New Construction and Major Renovations

Project Checklist

0	0	0	Indoor Environmental Quality	Possible Points:	16
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke Control	Required
			Credit 1	Enhanced Indoor Air Quality Strategies	1 to 2
			Credit 2	Low-Emitting Interiors	1 to 3
			Credit 3.1	Construction Indoor Air Quality Management Plan	1
			Credit 3.2	Indoor Air Quality Assessment	1 to 2
			Credit 4	Thermal Comfort	1
			Credit 5	Interior Lighting	1 to 2
			Credit 6	Daylight	1 to 3
			Credit 7	Quality Views	1
			Credit 8	Acoustic Performance	1

Figure 12: Indoor Environmental Quality category in USGBC's LEED 2012 for New Construction and Major Renovations

The abbreviation for this category is EQ in 2012, as opposed to IEQ in the previous versions. There are two significant changes in the Indoor Environmental Quality category between the 2009 and the 2012 versions of the LEED for New Construction and Major Renovations rating system. One change is the weighting of points: in 2009 each credit was awarded 1 point, but in 2012 the number of points for each credit varies. Some of this weighting is due to the fact that similar credits were combined into one in 2012 (such as the four Low-Emitting Materials credits from 2009 are now combined into one single Low-Emitting Interiors credit, which only awards 1-3 points and have more requirements than the 4 credits in 2009 which awarded a total of 4 points). Other credits offer more points in 2012 than in 2009 for achieving the same result, such as the Daylight credit, which in 2012 offers 3 points for achieving daylight in 75% of the regularly occupied spaces, as opposed to only 1 point in 2009. The other

significant change, which does affect historic building renovation projects, is the newly added Acoustic Performance credit.

Credit: Acoustic Performance. This credit requires meeting prescriptive requirements in the following 4 areas: room noise levels; sound isolation performance of constructions; limiting reverberation time and reverberant noise built-up; and paging, masking and sound reinforcement systems.[49]

Commentary: The credit offers an exemption for projects in which historic preservation requirements may interfere with meeting the credit criteria; however the exemption still requires the project to comply with 3 out of the 4 requirements,[50] which may still be difficult to achieve due to the prescriptive nature of the requirements.

Recommendations: Offer historic building renovation projects more flexibility with the exemption, allowing non-compliance if documentation is provided that compliance will interfere with the historic character of the building, or offer an alternative path for compliance.

[49] USGBC. LEED Rating System 3rd Public Comment Draft
[50] USGBC. LEED Rating System 3rd Public Comment Draft

Innovation in Design (ID)

			LEED 2009 for New Construction and Major Renovations		
			Project Checklist		
0	0	0	Innovation in Design	Possible Points:	**6**
			Credit 1.1	Innovation in Design: Specific Title	1
			Credit 1.2	Innovation in Design: Specific Title	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 1.5	Innovation in Design: Specific Title	1
			Credit 2	LEED Accredited Professional	1

Figure 13: Innovation in Design category in USGBC's LEED 2009 for New Construction and Major Renovations

			LEED 2012 for New Construction and Major Renovations		
			Project Checklist		
0	**0**	**0**	Innovation	Possible Points:	**6**
			Credit 1.1	**Innovation**	**1**
			Credit 1.2	**Pilot Credit**	**1**
			Credit 1.3	**Additional Strategies**	**1 to 3**
			Credit 2	**LEED Accredited Professional**	**1**

Figure 14: Innovation in Design category in LEED 2012 for New Construction and Major Renovations

The Innovation category in the 2012 LEED rating system is slightly more specific as to how points could be earned than the 2009 Innovation in Design category. A combination of options can be used, as follows: 1 point can be achieved through Option 1: Innovation, 1 point through Option 2: Pilot Credit, and up to 3 points through Option 3: Additional Strategies (these strategies could be Innovation for 1-3 points, Pilot Credit

for 1-3 points, or Exemplary Performance for 1-2 points).[51] The 2009 Innovation in Design category awards credits through a combination of any of the three paths: 1-5 points could be earned through Path 1: Innovation in Design, 1-3 points through Path 2: Exemplary Performance, and 1-5 points through Path 3: Pilot Credit.[52] These slight changes will likely not have an effect on historic building renovation projects.

Regional Priority (RP)

			LEED 2009 for New Construction and Major Renovations			
			Project Checklist			
0	0	0	Regional Priority Credits		Possible Points:	**4**
			Credit 1.1	Regional Priority: Specific Credit		1
			Credit 1.2	Regional Priority: Specific Credit		1
			Credit 1.3	Regional Priority: Specific Credit		1
			Credit 1.4	Regional Priority: Specific Credit		1

Figure 15: Regional Priority category in USGBC's LEED 2009 for New Construction and Major Renovations

[51] USGBC. LEED Rating System 3rd Public Comment Draft
[52] USGBC. LEED 2009 for New Construction and Major Renovations Rating System

			LEED 2012 for New Construction and Major Renovations			
			Project Checklist			
0	**0**	**0**	Regional Priority Credits		Possible Points:	**4**
			Credit 1.1	**Regional Priority: Specific Credit**		**1**
			Credit 1.2	**Regional Priority: Specific Credit**		**1**
			Credit 1.3	**Regional Priority: Specific Credit**		**1**
			Credit 1.4	**Regional Priority: Specific Credit**		**1**

Figure 16: Regional Priority category in USGBC's LEED 2012 for New Construction and Major Renovations

There is no indication in any of the LEED 2012 drafts as to what the regional priority credits might be, but four credits are listed, which is the same number as in 2009. The following six Regional Priority credits apply under the LEED-NC v2009 to the Austin, TX region where this thesis' case study of Battle Hall and West Mall Building is located. A project earns points in the Regional Priority category if any of the identified regional priority credits are achieved, up to a total of 4 points.

SS Credit 5.1: Site Development – Protect or Restore Habitat

SS Credit 6.1: Stormwater Design – Quantity Control

SS credit 6.2: Stormwater Design – Quality Control

WE credit 2: Innovative Wastewater Technologies

EA credit 2: On-Site Renewable Energy (1% Renewable Energy)

MR Credit 2: Construction Waste Management (75% Recycled or Salvaged)[53]

The Regional Priority credits will likely have to be reevaluated for LEED 2012, as all of the credits that apply to the Austin, TX region in LEED-NC v2009 have changed. A determination on whether or not Regional Priority credits have an effect on historic

[53] USGBC. 2012. "Regional Priority Credits." https://www.usgbc.org/RPC/RegionalPriorityCredits.aspx?CMSPageID=24 (Accessed April 27, 2012)

building renovation projects will be made once the Regional Priority credits are announced.

Chapter III

LEED-NC v2009 Applied to the Battle Hall and West Mall Building Renovation Project

The exercise of applying the LEED 2009 for New Construction and Major Renovations rating system to the Battle Hall and West Mall Building renovation project is a vital piece of the comparison between the 2009 and proposed 2012 versions of the rating system in terms of their application to historic building renovations. The two versions of the rating system are significantly different from one another, which precludes a point-by-point comparison; therefore the only accurate measure for comparison is to subject the same project to the two rating systems and interpret the results.

The LEED-NC v2009 analysis of the Battle Hall and West Mall Building renovation project is based on information gathered from the following sources:

- Battle Hall and West Mall Office Building feasibility draft drawings prepared by Parsons, the design team for the project, for the University of Texas at Austin;
- LEED-NC v2009 project checklist for the Battle Hall and West Mall Building renovation, prepared by Parsons, was referred to for credits where extensive calculations and/or engineering expertise was necessary, which the author of this thesis could not provide;
- LEED-NC v3 – 2009 Credit Guide, prepared by the University of Texas at Austin's Sustainable Facilities Committee to aid design teams working on University projects, discussing each credit as it applies to campus projects with accompanying commentary as to whether the pursuit of the credit is required, recommended or not recommended by the University;

- USGBC's *LEED Reference Guide for Green Building Design and Construction*, 2009 Edition. **Note:** All credit requirements in this analysis are based on the *LEED Reference Guide*. Separate footnotes will not be used.

Sustainable Sites (SS)

SS Prerequisite 1: Construction Activity Pollution Prevention

Credit anticipated: n/a – prerequisite must be met for LEED certification

Requirement: Create and implement an erosion and sedimentation control plan for all construction activities associated with the project, to conform with the 2003 EPA Construction General Permit or local standards, whichever is more stringent.

SS Credit 1: Site Selection

Credit anticipated: **1 point**

Requirement: This credit prohibits new development of buildings, hardscapes, roads or parking areas on land designated as prime farmland, on previously undeveloped land within 5' above the 100-year floodplain, on land designated as habitat for threatened or endangered species, on land within 100' of wetlands, on previously undeveloped land within 50' of a body of water, or on public parkland.

Commentary: The site of Battle Hall and West Mall Building is not in any of the prohibited areas; therefore his credit is expected to be achieved.

UT Austin requires that this credit be achieved, and UT System managed campus projects have consistently accomplished this.[54]

[54] The University of Texas at Austin. LEED NC (v3-2009) Credit Guide. (Sustainable Facilities Committee, 2011), 3.

SS Credit 2: Development Density and Community Connectivity

Credit anticipated: **5 points**

Requirement: This credit can be achieved by compliance with either one of the following two options: Option 1: Development Density can be met if the project is located on a previously developed site within a community with a minimum density of 60,000 SF per acre net; Option 2: Community Connectivity can be met if the project is located on a previously developed site, is within ½ mile of a residential area or neighborhood with an average density of 10 units per acre net, is within ½ mile of at least 10 basic services, and has pedestrian access between the building and the services.

Commentary: By virtue of its location, the Battle Hall and West Mall Building project meets both the Development Density and the Community Connectivity criteria. All 5 points are expected to be achieved for this credit.

UT Austin requires that this credit be achieved, and UT System managed campus projects have consistently accomplished this.[55]

SS Credit 3: Brownfield Redevelopment

Credit anticipated: **1 point** (LEED Interpretation)

Requirement: The site chosen for the project must be documented as contaminated by an environmental assessment or defined as a brownfield by a local, state or federal government agency.

Commentary: This credit can also be achieved by performing asbestos remediation on an existing building, as indicated in a LEED Interpretation from 5/9/2011. LEED Interpretations, formerly called Credit Interpretation Rulings (CIR), are precedent-

[55] UT Austin. LEED Credit Guide, 3.

setting rulings reviewed by the USGBC on formal questions from project teams; they can be applied to multiple projects.[56] This credit will be achieved on the Battle Hall and West Mall Building project through performing asbestos remediation.

UT Austin recommends pursuit of this credit where appropriate.[57]

SS Credit 4.1: Alternative Transportation—Public Transportation Access

Credit anticipated: **6 points**

Requirement: This credit can be achieved by compliance with either one of the following two options: Option 1: Rail Station Proximity can be met if the project is located within ½ mile walking distance of a commuter rail, light rail or subway station; Option 2: Bus Stop Proximity can be met if the project is located within ¼ mile walking distance of 1 or more stops for 2 or more public, campus or private bus lines.

Commentary: The Battle Hall and West Mall Building project meets the criteria of Option 2: Bus Stop Proximity and therefore all 6 points are expected to be achieved for this credit.

UT Austin requires that this credit be achieved, and UT System managed campus projects have consistently accomplished this. Additionally, the possibility exists for earning 1 point for Innovation in Design: Double Transit Ridership (Exemplary Performance). For this point to be earned, the project must be located within ¼ mile of at least 2 or more stops for 4 or more public or campus bus lines AND with a frequency of service of at least 200 transit rides per day. This point is currently being pursued by UT Austin for campus projects seeking certification under LEED-NC.[58]

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[56] USGBC. "LEED Interpretation and Addenda database." *https://www.usgbc.org/leedinterpretations/lilanding.aspx*. USGBC 2011 (Accessed 4/09/2012)
[57] UT Austin. LEED Credit Guide, 4.
[58] UT Austin. LEED Credit Guide, 4.

SS Credit 4.2: Alternative Transportation—Bicycle Storage and Changing Rooms

Credit anticipated: **1 point**

Requirement: For commercial or institutional projects, provide bicycle racks or storage within 200 yards of the building entrance for 5% or more of all the building users measured at peak periods, and provide shower and changing facilities in the building or within 200 yards of the building entrance for 0.5% of the full-time equivalent (FTE) occupants.

Commentary: While the bicycle racks or storage requirement will be easy to accommodate, further investigation is necessary on this credit to determine the number of FTE occupants in the building and to calculate the number of required shower and changing rooms. Currently there is no provision for showers and changing rooms in the Battle Hall and West Mall Building project, based on the feasibility study draft provided by the design team;[59] however, there is ample opportunity for this requirement to be accommodated in West Mall Building. This thesis considers this credit to be achieved based on the fact that the possibility exists for it to be realized.

UT Austin recommends pursuing this credit where appropriate, based on the owner project requirements.[60]

SS Credit 4.3: Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles

Credit anticipated: **3 points**

Requirement: One of the following options must be achieved: Option 1 – provide preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site, or provide a discounted rate of at least 20% available to all

[59] Parsons. "Battle Hall and West Mall Office Building." Feasibility Draft. 2011.
[60] UT Austin. LEED Credit Guide, 4.

low-emitting and fuel-efficient vehicles; Option 2 – install alternative fueling stations for 3% of the total vehicle capacity of the site; Option 3 – provide low-emitting and fuel-efficient vehicles, as well as parking for these vehicles, for 3% of the full-time equivalent (FTE) occupants; Option 4 – provide access to a low-emitting or fuel-efficient vehicle sharing program.

Commentary: Since the scope of the Battle Hall and West Mall Building project includes no new parking; the most viable option for achieving this credit is the alternate provision of Option 1: providing a discounted parking rate of at least 20% in a nearby UT parking garage for low-emitting and fuel-efficient vehicles. This can be accomplished by official policy with Parking and Transportation Services. Two UT parking garages are in close proximity of the project site, one ¼ mile away and one 1/3 mile away. All 3 points are expected to be achieved for this credit.

UT Austin recommends pursuing this credit where appropriate, based on the owner's project requirements.[61]

SS Credit 4.4: Alternative Transportation—Parking Capacity

Credit anticipated: **2 points**

Requirement: One of the following options must be achieved: Option 1 – parking capacity must meet but not exceed zoning requirements, and preferred parking be provided for carpools and vanpools for 5% of the total parking spaces; Option 2 – provide preferred parking for carpools and vanpools for 5% of total parking spaces, or provide a discounted parking rate of at least 20% for carpool and vanpool vehicles; Option 3 – provide no new parking.

[61] UT Austin. LEED Credit Guide, 5.

Commentary: The Battle Hall and West Mall Building project is expected to earn 2 points by pursuing Option 3: Provide no new parking; furthermore, four existing short-term (loading area) parking spaces are eliminated due to constructing the addition to Battle Hall.

UT Austin recommends pursuing this credit where appropriate, based on the owner's project requirements.[62]

SS Credit 5.1: Site Development—Protect or Restore Habitat

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Case 2 of this credit, applicable to previously developed areas or graded sites, requires that a minimum of 50% of the site (excluding building footprint) or 20% of the total site area (including building footprint), whichever is greater, be planted with native or adapted vegetation.

Commentary: This credit will not be possible to achieve in the case of Battle Hall and West Mall Building project due to the very limited vegetated open space around the building, which will get even further reduced in size by the addition on the south side of the building.

In the future this credit may be pursued at campus scale as part of a possible AGMBC (Application Guide for Multiple Buildings and On-Campus Building Projects), but the likelihood of it is unknown at this time. UT Austin does not recommend pursuing this credit on individual projects.[63]

[62] UT Austin. LEED Credit Guide, 5.
[63] UT Austin. LEED Credit Guide, 6.

SS Credit 5.2: Site Development—Maximize Open Space

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Case 2 of this credit, applicable to sites with no local zoning requirements (such as some university campuses), requires that the area of vegetated open space provided adjacent to the building be equal to that of the building footprint. Case 3 of this credit, applicable to sites with zoning ordinances but no open space requirements, requires that that the area of vegetated open space provided adjacent to the building be equal to 20% of the project's site area.

Commentary: This credit will not be possible to achieve in the case of Battle Hall and West Mall Building project due to the very limited landscaping area around the building, which will get even further reduced in size by the addition on the south side of the building.

In the future this credit may be pursued at campus scale as part of a possible AGMBC (Application Guide for Multiple Buildings and On-Campus Building Projects), but the likelihood of it is unknown at this time. UT Austin does not recommend pursuing this credit on individual projects.[64]

SS Credit 6.1: Stormwater Design—Quantity Control

Credit anticipated: **1 point**

Requirement: Case 2 of this credit, which applies to sites with existing impervious cover greater than 50%, requires a stormwater management plan that results in a 25% decrease in the volume of the stormwater runoff from the 2-year 24-hour design storm.

[64] UT Austin. LEED Credit Guide, 6.

Commentary: This credit is expected to be achieved in the Battle Hall and West Mall Building renovation project. By achieving this credit, the project will also earn an additional point in the Regional Priority (RP) category.

UT Austin requires pursuit of this credit as an Add Alternate to the construction contract, employing a design that will capture the runoff in the campus recovered water system in order to be used as a non-potable water source. The project leadership will determine whether or not to pursue this credit based on a cost benefit analysis. This thesis considers that this credit will be achieved based on the fact that the possibility exists for it to be realized.[65]

SS Credit 6.2: Stormwater Design—Quality Control

Credit anticipated: **0 point** (out of a maximum of 1 point)

Requirement: Capture and treat stormwater runoff from 90% of the average rainfall by using acceptable best management practices (BMP), capable of removing 80% of the average annual post-development total suspended solids (TSS).

Commentary: The author of this thesis is unable to assess the feasibility of this credit, therefore this thesis will consider this credit not to be achieved, based on the LEED Project checklist prepared by Parsons.[66] Were this credit achieved, the project would also have earned an additional point in the Regional Priority (RP) category.

UT Austin requires pursuit of this credit as an Add Alternate to the construction contract, stating that this credit is likely pursued or not pursued together with the previous credit. By capturing the runoff in the UT Austin campus recovered water system, the

[65] UT Austin. LEED Credit Guide, 7.
[66] Parsons. "Battle Hall Complex – West Mall Office Building Renovation Study." LEED 2009 for New Construction and Major Renovation Project Checklist. Last Updated October 2011.

project may earn this credit at no additional cost through a LEED Interpretation. This possibility needs to be investigated further. The project leadership will determine whether or not to pursue this credit along with the previous one based on a cost benefit analysis.[67]

SS Credit 7.1: Heat Island Effect—Non-roof

Credit anticipated: **1 point**

Requirement: Option 1 of this credit requires that 50% of the site hardscape be shaded by trees, or by structures covered by solar panels or other shading devices with a minimum solar reflectance index (SRI) of at least 29, or use hardscape materials with an SRI of 29 or more, or use an open grid pavement system that is at least 50% pervious.

Commentary: In the case of the Battle Hall and West Mall Building, 50% or more of the site is already vegetated or shaded by large existing trees, as seen in a Google Earth aerial view. This credit is expected to be achieved on the Battle Hall and West Mall Building renovation project.

UT Austin requires that this credit be achieved, and UT System managed campus projects have consistently accomplished this.[68]

SS Credit 7.2: Heat Island Effect—Roof

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Use of roofing materials with an SRI greater than 78 for low-sloped roofs and greater than 29 for steep-sloped roofs to cover a minimum of 75% of the roof

[67] UT Austin. LEED Credit Guide, 7.
[68] UT Austin. LEED Credit Guide, 8.

surface, or the installation of a vegetated roof that covers at least 50% of the roof area, or a combination of these options.

Commentary: In the case of Battle Hall and West Mall Building this credit is not achievable, even with a vegetated roof over the addition, due to the fact that most of the existing roof area consists of Spanish clay tiles, which are a character defining feature of the building and of the campus.

UT Austin recommends pursuing this credit where appropriate,[69] which would be applicable to new construction or renovation of newer campus buildings.

SS Credit 8: Light Pollution Reduction

Credit anticipated: **1 point**

Requirement: This credit requires light reduction of at least 50% between 11pm and 5am where visible from the exterior, or all openings in the envelope receive shielding to prevent light transmittance to the exterior of more than 10%; additionally, exterior lighting must only be used as required for safety and comfort, and no more than 5% lumens must cross the site boundaries.

Commentary: This credit is expected to be achieved in the Battle Hall - West Mall Building Renovation project.

UT Austin recommends pursuing this credit where appropriate.[70]

A total of **22 points** out of a maximum of 26 are anticipated to be achieved in the SS category by the Battle Hall and West Mall Building renovation project under LEED-NC v2009.

[69] UT Austin. LEED Credit Guide, 8.
[70] UT Austin. LEED Credit Guide, 9.

Water Efficiency (WE)

WE Prerequisite 1: Water Use Reduction

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Use 20% less water than the baseline use calculated for the building (excluding irrigation) in accordance with the Energy Policy Act of 1992.

Commentary: Strategies employed to meet the requirements include installation of low-flow lavatories, sinks and shower heads where appropriate; installation of automatic faucet sensors, high-efficiency/ dual-flush water closets and urinals, as well as waterless fixtures where appropriate. Some or all of these strategies may not be appropriate or possible in the case of the historic plumbing fixtures in Battle Hall, which are character defining features. Careful consideration must be given to such issues in historic buildings, so that historic fabric is not unnecessarily sacrificed.

Rainwater collected may be used for non-potable uses. UT Austin Facilities Maintenance must be consulted to determine if "non-traditional" approaches (i.e. waterless urinals, etc.) are allowed. UT Austin requires compliance with this prerequisite.[71]

WE Credit 1: Water Efficient Landscaping

Credit anticipated: **4 points**

Requirement: Reduce potable water consumption for irrigation by 50% compared to a calculated midsummer baseline case (2 points). Achieve previous AND use no potable water for irrigation (use only captured rainwater, recycled wastewater or

[71] UT Austin. LEED Credit Guide, 10.

graywater, etc.) or install landscaping that does not require permanent irrigation (temporary irrigation for plant establishment are allowed if removed within 1 year) (4 points).

Commentary: For the Battle Hall – West Mall Building, installing landscaping with climate-tolerant plants and using captured rainwater or reclaimed water for irrigation will facilitate meeting the requirements of this credit. The Owner's Project Requirements (OPR) state that native, adapted and xeriscape plant material are to be installed, and turf is to be eliminated where possible, in order to reduce the need for irrigation, while restoring elements of the native landscape from the 1933-1934 campus master plan.[72] All 4 points are anticipated to be achieved for this credit.

UT Austin recommends pursuing this credit where appropriate, depending on the project scope and based on the owner's project requirements.[73]

WE Credit 2: Innovative Wastewater Technologies

Credit anticipated: **2 points**

Requirement: Reduce the amount of potable water entering the sewer system by 50%, by employing water-conserving fixtures and non-potable water use; OR treat 50% of wastewater on site to tertiary standards.

Commentary: This credit pertains better to new construction projects, but it can be achievable on major renovation projects as long as careful planning and provisions are made early in the design process. Projects at UT Austin can take advantage of the auxiliary water sources, such as rainwater collection, AC condensate collection and

[72] UT Austin. OPR.
[73] UT Austin. LEED Credit Guide, 10.

reclaimed wastewater, available on campus.[74] The OPR specifically precludes the use of reclaimed water inside the building,[75] but rainwater and AC condensate collection is not mentioned therefore it is assumed to be permissible. A secondary plumbing system will be necessary to convey the non-potable water to the respective plumbing fixtures, which could be accommodated in West Mall Building, and could be used only on West Mall Building plumbing fixtures as to not disturb historic fabric in Battle Hall. Both points are expected to be achieved for this credit on the Battle Hall and West Mall building renovation. By achieving this credit, the project will also earn an additional point in the Regional Priority (RP) category.

UT Austin recommends pursuing this credit where appropriate, as an Add Alternate to the construction contract, depending on the project scope and based on the owner's project requirements. The project leadership will determine whether or not to pursue this credit based on a cost benefit analysis.[76]

WE Credit 3: Water Use Reduction

Credit anticipated: **3 points** (out of a maximum of 4 points)

Requirement: Employ water use reduction strategies (not including irrigation) that amount to a reduction of 30%, 35% or 40% of the calculated baseline for the building (2 points are awarded for 30% reduction, 3 points for 35%, and 4 points for 40% reduction).

Commentary: UT Austin requires achieving the 30% water use reduction threshold, and recommends pursuing further reduction options to achieve 35% and 40% water use reduction. UT Austin indicates that reducing levels of potable water

[74] UT Austin. LEED Credit Guide, 11.
[75] UT Austin. OPR.
[76] UT Austin. LEED Credit Guide, 11.

consumption beyond 30% are difficult to achieve by use of high-efficiency fixtures alone,[77] but they can be achieved by utilizing non-potable water sources available on campus, such as rainwater collection and AC condensate collection, for water closet and urinal flushing.

For this credit, the Battle Hall and West Mall Building project will employ high-efficiency plumbing fixtures as described in WE Prerequisite 1, combined with the use of non-potable water sources for water closet and urinal flushing as recommended by UT Austin. A water use reduction of 35% of the calculated baseline for the building is anticipated, as indicated by Parsons, the design team on the project.[78] Thus the project is expected to earn 3 points out of the maximum of 4 points available for this credit.

A total of **9 points** out of a maximum of 10 are anticipated to be achieved in the WE category by the Battle Hall and West Mall Building renovation project under LEED-NC v2009.

[77] UT Austin. LEED Credit Guide, 12.
[78] Parsons. LEED-NC 2009 Project Checklist.

Energy and Atmosphere (EA)

EA Prerequisite 1: Fundamental Commissioning of Building Energy Systems

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Designate a commissioning authority (CxA) to review owner's project requirements and design team's basis of design; develop and implement a commissioning plan; verify installation and performance of systems, and complete summary commissioning report.

EA Prerequisite 2: Minimum Energy Performance

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: There are 3 options for compliance with this credit: Option 1 – Whole Building Energy Simulation (for major renovations and existing buildings, demonstrate a 5% improvement in the proposed building performance when compared with baseline building performance); Option 2 – Prescriptive Compliance Path: ASHRAE Energy Design Guide (Path 1: ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004; Path 2: ASHRAE Advanced Energy Design Guide for Small Retail Buildings 2006; Path 3: ASHRAE Advanced Energy Design Guide for Small Warehouses and Self-Storage Buildings 2008); or Option 3 – Prescriptive Compliance Path: Advanced Buildings Core Performance Guide (comply with the prescriptive measures stated in the guide).

Commentary: This prerequisite will be met through Option 1 – Whole Building Energy Simulation, demonstrating a 5% improvement in the proposed building performance as compared to a baseline performance.

UT Austin requires compliance with this prerequisite, but leaves the method to be selected by the professional service provider.[79]

EA Prerequisite 3: Fundamental Refrigerant Management

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: For an existing building renovation, where reusing existing HVAC equipment, the requirement is to complete a comprehensive chlorofluorocarbon (CFC)-based refrigerants phase-out plan.

Commentary: UT Austin requires compliance with this prerequisite, and additionally it requires that any project that uses chilled water from the campus chilling stations provide a copy of the phase-out commitment and leak-protection plan.[80]

EA Credit 1: Optimize Energy Performance

Credit anticipated: **8 points** (out of a maximum of 19 points)

Requirement: Follow one of the 3 compliance paths: Option 1 – Whole Building Energy Simulation (possible 1-19 points); Option 2 – Prescriptive Compliance Path: ASHRAE Energy Design Guide (1 point); or Option 3 – Prescriptive Compliance Path: Advanced Buildings Core Performance Guide (1-3 points).

Commentary: UT Austin requires that Option 1 be followed, demonstrating improvement in the proposed project as compared with baseline building performance. UT Austin sets a threshold of minimum 40% improvement (achieving 15 points) for new construction on campus, but does not set a similar threshold for existing building

[79] UT Austin. LEED Credit Guide, 14.
[80] UT Austin. LEED Credit Guide, 15.

renovations. The same 15 points on the scale of existing building renovations are achieved by a 36% improvement over the baseline building performance.[81]

Further investigation and whole building energy modeling is necessary in order to determine what percentage improvement and how many points the Battle Hall and West Mall Building project can achieve. The project design team, at the feasibility study stage of the project, is estimating a 22% improvement (yielding 8 points) in the proposed building performance as compared with its baseline performance, with the potential of reaching a maximum of 28% improvement (11 points).[82]

EA Credit 2: On-site Renewable Energy

Credit anticipated: **0 points** (out of a maximum of 7 points)

Requirement: Provide on-site renewable energy systems to offset building energy costs. There are renewable energy thresholds between 1% and 13%, with up to 7 possible points to achieve.

Commentary: UT Austin recommends that if this credit is to be pursued, as it may be on a project by project basis, it is written and bid as an Add Alternate to the construction contract. However, due to the high efficiency of UT's energy system and the small available building footprint, it is unlikely that on-site renewable energy will provide viable savings. Furthermore, UT Austin indicates that the greatest chance to achieve points in this category would be through rooftop photovoltaic panels, but they are costly and can present esthetical concerns; wind levels are too low in Austin for effective

[81] UT Austin. LEED Credit Guide, 16.
[82] Parsons. LEED-NC 2009 Project Checklist.

use of wind energy, and solar heating would have only minor impacts on the building energy usage.[83]

In the case of the Battle Hall and West Mall Building, rooftop PV panels are not a feasible option due to the buildings' Spanish clay tile roofs, which are character defining features of the buildings as well as the entire campus. In many cases of historic buildings, rooftop PV panels would not be appropriate and such considerations should be kept in mind. This credit will not be pursued on the Battle Hall and West Mall Building renovation project.

EA Credit 3: Enhanced Commissioning

Credit anticipated: **2 points**

Requirement: In addition to the requirements of EA Prerequisite 1, commissioning authority (CxA) must be independent of the project work, be involved early in the process, and conduct at a minimum 1 commissioning design review of the owner's project requirements basis of design, and of the design documents prior to the mid-construction documents phase as well as subsequent design submissions; the CxA must also develop an operating manual, verify requirements for training operating personnel, and review the operations of the building with operations and maintenance staff and occupants within 10 months after substantial completion.

Commentary: This credit is expected to be achieved in the Battle Hall - West Mall Building Renovation project.

UT Austin requires that this credit be achieved on LEED-mandated projects.[84]

[83] UT Austin. LEED Credit Guide, 16.
[84] UT Austin. LEED Credit Guide, 17.

EA Credit 4: Enhanced Refrigerant Management

Credit anticipated: **2 points**

Requirement: One of two options must be met for compliance with this credit. Option 1 prohibits the use of refrigerants; Option 2 requires selecting refrigerants that minimize or eliminate the emissions of compounds that contribute to ozone depletion and global climate change.

Commentary: This credit is expected to be achieved in the Battle Hall - West Mall Building Renovation project, as construction will take place after 2011 (see below).

UT Austin will require compliance with this credit after 2011 on the Main Campus, as the last remaining chiller using R-12 refrigerant is being retrofitted. After the retrofit, any building using the campus chilled water system will automatically achieve this credit.[85]

EA Credit 5: Measurement and Verification

Credit anticipated: **3 points**

Requirement: Develop and implement a measurement and verification plan (M&V) to ensure that the building performs as designed in terms of energy consumption. The M&V period must cover at least 1 year post-occupancy.

Commentary: This credit is expected to be achieved in the Battle Hall and West Mall Building renovation project.

UT Austin requires this credit be achieved, as it would support the required Enhanced Commissioning efforts.[86]

[85] UT Austin. LEED Credit Guide, 17.
[86] UT Austin. LEED Credit Guide, 18.

EA Credit 6: Green Power

Credit anticipated: **0 points** (out of a maximum of 2 points)

Requirement: Engage in at least a 2-year renewable energy contract to provide at least 35% of the building's electricity from renewable sources.

Commentary: This credit will not be pursued on the Battle Hall and West Mall Building renovation project.

UT Austin disallows this credit, as the highly energy-efficient campus utilities meet 100% of the campus energy needs; furthermore, the campus is not prepared to offset 35% of its total electricity requirements through Austin Energy's Greenchoice Program.[87]

A total of **15 points** out of a maximum of 35 are anticipated to be achieved in the EA category by the Battle Hall and West Mall Building renovation project under LEED-NC v2009.

[87] UT Austin. LEED Credit Guide, 18.

Materials and Resources (MR)

MR Prerequisite 1: Storage and Collection of Recyclables

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Provide easily-accessible designated areas for collection and storage of recyclables, to include at a minimum the collection of paper, corrugated cardboard, plastic, metals and glass.

Commentary: Careful consideration must be given to the placement of the collection and storage area in a historic building, as to not adversely affect the historic fabric.

MR Credit 1.1: Building Reuse—Maintain Existing Walls, Floors and Roof

Credit anticipated: **2 points** (out of a maximum of 3 points)

Requirement: Maintain existing building structure (including structural floor and roof decking) and building envelope (including framing but excluding window assemblies and non-structural roofing material), based on the following thresholds: 1 point is awarded for 55% building reuse, 2 points for 75% building reuse and 3 points for 95% building reuse. The credit excludes hazardous materials that must be remedied, and such materials must be subtracted from the percentage of building reused.

Commentary: In the case of Battle Hall and West Mall Building, given the significant historical value of Battle Hall and the care and attention with which it is being preserved and rehabilitated, 75% building reuse will not be difficult to achieve. However 95% building reuse is most likely not achievable due to the scope of the project, which includes providing a connection between the two adjacent but presently not connected

buildings, as well as realizing handicapped accessibility. Connecting the buildings requires new openings in the west wall of Battle Hall and the east wall of West Mall Building, which will affect the area of exterior building envelope and framing that will be saved. Likewise, the proposed two-story addition on the south side of the buildings will require new openings in the south wall of West Mall Building. The west wall of Battle Hall has original window openings still intact but covered up by adjacent West Mall Building. These existing openings should be used as part of the connection, but given the fact that the floor levels in West Mall Building do not coincide with those of Battle Hall, connecting them is likely to require enlarging the existing openings. Additionally, in order to realize handicapped accessibility, some of the floors will need to be cut and stairs, ramps and elevators added, thus reducing the area of structural floors to be saved.

UT Austin recommends that these credits be pursued in a renovation project, but recognizes that the ability to achieve them depends on the scope of the project.[88]

MR Credit 1.2: Building Reuse—Maintain Interior Non-Structural Elements

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Retain 50% (by area) of the existing interior non-structural elements (including interior walls, doors, floor coverings, ceiling systems and casework). For this calculation, the area of the retained non-structural elements is divided by the total area of non-structural elements in the completed building, including any additions (however, if the addition is more than twice the square footage of the existing building, this credit may not be pursued).

[88] UT Austin. LEED Credit Guide, 19.

Commentary: This credit is unlikely to be achieved in the case of Battle Hall and West Mall Building, despite the significant historic interiors of Battle Hall which are being retained. West Mall Building, comprised of six floors with interiors of no particular historical significance, is beings completely redesigned; additionally, some modifications are being made in secondary spaces of Battle Hall to especially to accommodate connections to West Mall Building or to the exterior. The modifications will most likely yield to an area of retained interior non-structural elements of less than 50% of the total area of non-structural elements in the completed building (including the two-story addition).

As with MR credit 1.1, UT Austin recommends that this credit be pursued in a renovation project, but recognizes that the ability to achieve it depends on the scope of the project.[89]

MR Credit 2: Construction Waste Management

Credit anticipated: **2 points**

Requirement: Develop and implement a waste management plan to recycle and/or salvage non-hazardous construction materials and demolition debris (excluding excavated soil and land-clearing debris). The plan should, at a minimum, identify what materials will be diverted from disposal, and whether they will be sorted on-site or comingled. Calculations are to be done by dividing the quantity of construction debris diverted from disposal by the total amount of construction debris generated by the project (measured either by weight or by volume, but must be consistent throughout). The result is

[89] UT Austin. LEED Credit Guide, 20.

expressed as a percentage, and points are awarded as follows: 1 point for 50% and 2 points for 75% of construction debris diverted from disposal, after abatement.

Commentary: Both points are expected to be achieved in the Battle Hall - West Mall Building project. UT Austin requires that the 75% threshold be achieved, and this is being consistently accomplished on UT System managed projects. By diverting 75% of construction debris from disposal, the project will also earn an additional point in the Regional Priority (RP) category.[90]

MR Credit 3: Materials Reuse

Credit anticipated: **2 points**

Requirement: Use refurbished or reused materials on the project to constitute at least 5% (to be awarded 1 point) or 10% (to be awarded 2 points) of the total cost of materials used on the project. Contributing to the credit could be reused materials found on-site as well as previously used materials brought from off-site locations.

Commentary: UT Austin does not recommend pursuing this credit due to the fact that in a university setting materials are generally subjected to excessive wear and tear, therefore the university requires new, durable materials to achieve maximum warranty and useful life. However, the credit can be pursued, if appropriate, on selected projects.[91]

The Battle Hall and West Mall Building Renovation is a project where it may be appropriate to pursue this credit. Due to its use as the Architecture and Planning Library, architectural archives, materials and conservation laboratories, faculty offices, in addition to a limited number of classrooms, Battle Hall and West Mall building will not have a large number of occupants on a regular basis. The highly specialized use of the buildings

[90] UT Austin. LEED Credit Guide, 20.
[91] UT Austin. LEED Credit Guide, 21.

means that the typical wear and tear that the university is concerned about will be far less than the campus average; therefore durability and warranty alone will not be a significant enough concern as to prevent the pursuit of this credit. Possible options for reusing materials found on-site would be to reuse the high quality wood from the original windows in the west wall of Battle Hall (currently covered up by West Mall Building), as well as the library stacks currently on the basement and first floor of Battle Hall (which will be displaced when creating the connection between the two buildings).

Additionally, there is an opportunity for materials from Battle Hall and West Mall Building to be reused elsewhere on campus and potentially contribute to a LEED credit on another project: the existing red Spanish clay tiles on the roof on Battle Hall, which are not original, were install at the same time that West Mall Building was constructed. These tiles are monochromatic, while the original tiles were multi-colored. The University intends to reinstate tiles consistent to the original mix of colors, and therefore the existing tiles which are in very good condition will be available for reuse on another project.

MR Credit 4: Recycled Content

Credit anticipated: **2 points**

Requirement: Use materials with recycled content that meet the criteria that the sum of post-consumer recycled content plus ½ of the pre-consumer recycled content constitutes at least 10% (awarded 1 point) or 20% (awarded 2 points) of the total value of the materials in the project, based on cost.

Commentary: Both points are expected to be achieved in the Battle Hall and West Mall Building renovation project. Examples of materials that may contribute to this

credit are steel and drywall to be used in the interior construction of West Mall Building, as the Basis of Design (BOD) document states that the interiors of West Mall Building will be of steel studs and drywall construction.[92] UT Austin requires the use of materials with 20% recycled content, and this threshold has been successfully achieved or exceeded on projects managed by UT Systems.[93]

MR Credit 5: Regional Materials

Credit anticipated: **2 points**

Requirement: Use materials and products that have been extracted, harvested, recovered and manufactured within 500 miles of the project site to constitute at least 10% (awarded 1 point) or 20% (awarded 2 points) of the total value of the materials on the project, based on cost. If only a fraction of the material content (based on weight) has been extracted, harvested, recovered and manufactured locally, then only that percentage will contribute to the regional value.

Commentary: Both points are expected to be achieved in the Battle Hall and West Mall Building renovation project. Materials that can contribute to this credit are stone and/ or brick to be used for the exterior of the addition on the south side of the buildings, as the BOD document identifies these materials as appropriate for the exterior of the addition.[94] UT Austin requires that 20% of the materials used on a project be extracted, harvested, recovered and manufactured locally, and this threshold has been successfully achieved or exceeded on projects managed by UT Systems.[95]

[92] UT Austin. BOD.
[93] UT Austin. LEED Credit Guide, 21.
[94] UT Austin. BOD.
[95] UT Austin. LEED Credit Guide, 22.

MR Credit 6: Rapidly Renewable Materials

Credit anticipated: **1 point**

Requirement: Use rapidly renewable building materials and products to amount to 2.5% of the total value of building materials and products used on a project, based on cost. Rapidly renewable building materials and products are defined as those made from plants that are harvested within a 10-year (or shorter) cycle. Examples of rapidly renewable building materials include cork flooring, bamboo flooring and plywood, natural rubber and linseed (linoleum) flooring, wheatboard and strawboard cabinetry, sunflower seed board panels, cotton batt insulation, wool carpeting, bio-based paints, geo-textile fabrics, etc.

Commentary: UT Austin allows this credit on specific projects, if appropriate, and requires that such material choices, if pursued, be reviewed by the office of Project Management and Construction Services (PMCS). Natural rubber, linoleum flooring, cork flooring and wool carpeting have been used on campus projects, some in the historic Main Building. [96]

Just as in the case of MR credit 3, the Battle Hall and West Mall Building Renovation is a project where it may be appropriate to pursue this credit. Due to its highly specialized use, the building will not have a large number of occupants on a regular basis, meaning that the typical wear and tear the university is concerned about will be far less here than the campus average; therefore durability and warranty alone will not be a significant enough concern as to prevent the pursuit of this credit. Furthermore, the original Battle Hall drawings indicate that the reading room of the library was to receive cork flooring (although it is unclear whether or not that was ever achieved); a good case can be made here from both a sustainable and a historic preservation point of

[96] UT Austin. LEED Credit Guide, 22.

view, to install rapidly renewable cork flooring and reinstate the original architect's intent.

MR Credit 7: Certified Wood

Credit anticipated: **1 point**

Requirement: A minimum of 50% (based on cost) of all wood-based materials permanently installed on the project (such as dimensional framing, flooring, sub-flooring, wood doors and finishes) must be certified in accordance to the Forest Stewardship Council's (FSC) principles and criteria. If temporary wood products (such as formwork, bracing, scaffolding, etc.) are to be included in this calculation, than all such products used on the project must be included; if such products are used for more than one project, they may only count for this credit on one project. Furniture may be included in this credit only if it is consistently included in MR credit 3 through MR credit 7.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project.

UT Austin requires this credit to be pursued but specified and bid as an Add Alternate item. The project leadership will then determine whether or not to pursue this credit based on a cost benefit analysis.[97]

A total of **12 points** out of a maximum of 14 are anticipated to be achieved in the MR category by the Battle Hall and West Mall Building renovation project under LEED-NC v2009.

[97] UT Austin. LEED Credit Guide, 23.

Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1: Minimum Indoor Air Quality Performance

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Mechanical ventilation (i.e., active ventilation) must comply with Sections 4-7 of ASHRAE 62.1-2007 or with the applicable local code, whichever is more stringent. Natural ventilation (i.e., passive ventilation) is required to comply with ASHRAE 62.1-2007, Paragraph 5.1. A combination of the two methods can be used as well.

IEQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Compliance with this prerequisite can be achieved through one of the following two options: Option 1: prohibit smoking inside the building, and prohibit smoking on the property within 25' of entries, outdoor air intakes and operable windows; Option 2: prohibit smoking inside the building except in designated smoking areas, provide smoking rooms directly exhausted to the outdoors, and prohibit smoking on the property within 25' of entries, outdoor air intakes and operable windows.

Commentary: UT Austin requires compliance with Option 1 of this prerequisite; smoking inside University buildings is already prohibited, and regulations against smoking on campus have recently been passed.[98]

[98] UT Austin. LEED Credit Guide, 24.

IEQ Credit 1: Outdoor Air Delivery Monitoring

Credit anticipated: **1 point**

Requirement: Install permanent monitoring systems to ensure that ventilation meets minimum design requirements, by installing an alarm system to sound if airflow values or carbon dioxide levels vary by 10% or more from the design requirements. Additionally, carbon dioxide concentrations must be monitored in all densely populated spaces with mechanical ventilation, as well as in all naturally ventilated spaces, with monitors placed between 3-6 feet above floor.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project.

UT Austin requires that this credit be achieved, and anticipates that this credit will facilitate sustainable operations and may aid in subsequent LEED-EB: OM certification and/ or improved indoor air quality.[99]

IEQ Credit 2: Increased Ventilation

Credit anticipated: **0 point**s (out of a maximum of 1 point)

Requirement: Increase breathing zone outdoor air ventilation rates in all occupied spaces by at least 3% over the minimum rates set forth in IEQ Prerequisite 1.

Commentary: This credit will not be pursued on the Battle Hall and West Mall Building project.

UT Austin does not recommend pursuing this credit (although it may be appropriate for the protection of occupants to pursue on laboratory projects) due to cost

[99] UT Austin. LEED Credit Guide, 25.

implications, as conditioning the outdoor air in the hot Texas climate is very expensive.[100]

IEQ Credit 3.1: Construction Indoor Air Quality Management Plan—During Construction

Credit anticipated: **1 point**

Requirement: Develop and implement of an IAQ management plan during construction and pre-occupancy to meet ANSI/SMACNA 008-2008 (Chapter 3), as well as protect on-site installed absorptive materials from moisture damage, and use MERV 8 filters at each return air grill if permanently installed HVAC system is operational during construction (filters to be replaced immediately prior to occupancy).

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved.[101]

IEQ Credit 3.2: Construction Indoor Air Quality Management Plan—Before Occupancy

Credit anticipated: **1 point**

Requirement: Develop and implement an IAQ management plan after all finishes have been installed and the building has been thoroughly cleaned prior to occupancy, complying with either one of two options. Option 1- Flush-Out, could be accomplished through either one of two paths: Path 1 – after construction ends and prior to occupancy, with all finishes installed, perform a building flush-out with 14,000 cubic feet of outdoor air per SF of floor area, at an internal temperature of 60°F and max. RH of 60%; or Path

[100] UT Austin. LEED Credit Guide, 25.
[101] UT Austin. LEED Credit Guide, 26.

2 – if occupancy is desired prior to completion of flush-out, the space may be occupied after delivery of 3,500 cubic feet of outdoor air per SF of floor area, and must ventilated after occupancy at a minimum of 0.30 cubic cfm per SF or according to the outside air rate determined in IEQ Prerequisite 1, whichever is greater. Conditions must be maintained until a total 14,000 cubic feet per SF of outside air has been delivered. Option 2 – Conduct air testing per EPA Compendium of Methods for Determination of Air Pollutants in Indoor Air.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved, and advises that Option 2 – Air Testing is desirable for University projects over the flush-out options, as it minimizes schedule disruptions.[102]

IEQ Credit 4.1: Low-Emitting Materials—Adhesives and Sealants

Credit anticipated: **1 point**

Requirement: All adhesives and sealants used inside the building (defined as the area inside the weatherproofing) and applied on-site must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168, which regulates the content of volatile organic compounds (VOC).

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved, and the credit has been consistently achieved on UT System managed projects.[103]

[102] UT Austin. LEED Credit Guide, 26.
[103] UT Austin. LEED Credit Guide, 28.

IEQ Credit 4.2: Low-Emitting Materials—Paints and Coatings

Credit anticipated: **1 point**

Requirement: All paints and coatings used inside the building (defined as the area inside the weatherproofing) and applied on-site must comply with Green Seal Standard GS-11 for architectural paints and coatings applied to interior walls and ceilings, Green Seal Standard GC-03 for anti-corrosive and anti-rust paints applied to metals, and South Coast Air Quality Management District (SCAQMD) Rule #1113 for clear wood finishes, floor coatings, stains, primers and shellacs applied to interior elements.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved, and the credit has been consistently achieved on UT System managed projects.[104]

IEQ Credit 4.3: Low-Emitting Materials—Flooring Systems

Credit anticipated: **1 point**

Requirement: Meet the following requirements: all carpet installed inside the building meets the requirements of the Carpet and Rug Institute Green Label Plus Program; all carpet cushion installed inside the building meets the requirements of the Carpet and Rug Institute Green Label Program; all carpet adhesive meets the requirements of IEQ credit 4.1; all hard surface flooring installed inside the building is certified as compliant with the FloorScore standard; all sealer, stain and finish used for concrete, wood, bamboo and cork flooring is compliant with South Coast Air Quality Management District (SCAQMD) Rule #1113; and the tile adhesive and grout is compliant with South Coast Air Quality Management District (SCAQMD) Rule #1168.

[104] UT Austin. LEED Credit Guide, 28.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved, and the credit has been consistently achieved on UT System managed projects.[105]

IEQ Credit 4.4: Low-Emitting Materials—Composite Wood and Agrifiber Products

Credit anticipated: **1 point**

Requirement: All composite wood and agrifiber products (defined as particle board, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates and door cores, but excluding fixtures, furniture and equipment) used inside the building must contain no added urea-formaldehyde resins. These requirements extend to laminating adhesives as well, whether used on site or shop applied.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved, and the credit has been consistently achieved on UT System managed projects.[106]

IEQ Credit 5: Indoor Chemical and Pollutant Source Control

Credit anticipated: **1 point**

Requirement: Control the entry of pollutants into the building, by requiring the following: install permanent entryway systems (grates and grills preferred, roll-out mats only if maintained on a weekly basis) of at least 10’ long in the primary direction of travel, to capture dirt and particulates; exhaust spaces where hazardous gases or chemicals may be present (housekeeping area, science labs, copying and printing rooms)

[105] UT Austin. LEED Credit Guide, 30.
[106] UT Austin. LEED Credit Guide, 31.

to create negative pressure with respect to adjacent spaces when doors are closed; install MERV 13 filters or higher for both supply and return air; provide containment to facilitate safe disposal of hazardous liquid waste in places where chemical concentrate mixing occurs (housekeeping, science labs).

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved, considering it a worthy investment; the credit has consistently been achieved on UT Systems managed projects.[107]

IEQ Credit 6.1: Controllability of Systems—Lighting

Credit anticipated: **1 point**

Requirement: Provide individual lighting controls for a minimum of 90% of the building occupants, and lighting system controls be provided for all shared multi-occupant spaces.

Commentary: This credit is anticipated to be achieved on the Battle Hall and West Mall Building project by providing lighting controls for full-time building occupants in the library and offices, as well as lighting controls for classrooms and library spaces and task lighting for library reading room and study areas.

UT Austin recommends that this credit be pursued on a case by case basis, based on the owner's project requirements, recognizing that with individual control there is the potential for abuse which could in fact offset the energy savings; approximately 50% of UT Systems managed LEED-NC projects have achieved this credit.[108]

[107] UT Austin. LEED Credit Guide, 32.
[108] UT Austin. LEED Credit Guide, 33.

IEQ Credit 6.2: Controllability of Systems—Thermal Comfort

Credit anticipated: **1 point**

Requirement: Provide individual comfort controls for a minimum of 50% of the building occupants, and comfort system controls be provided for all shared multi-occupant spaces.

Commentary: This credit is anticipated to be achieved on the Battle Hall and West Mall Building project by providing individual comfort controls for full-time building occupants in the library and offices, as well as comfort controls for the shared spaces located in areas where they can be monitored by staff as to ensure proper usage.

UT Austin recommends that this credit be pursued on a case by case basis, based on the owner's project requirements, recognizing that with individual control there is the potential for abuse which could in fact offset the energy savings; approximately 50% of UT Systems managed LEED-NC projects have achieved this credit. [109]

IEQ Credit 7.1: Thermal Comfort—Design

Credit anticipated: **1 point**

Requirement: Design the HVAC systems and building envelope in accordance with the ASHRAE Standard 55-2004, and demonstrate design compliance in accordance with Section 6.1.1 documentation.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved, and UT System managed projects are consistently accomplishing this; this is a UT Austin requirement in the MEP design standards. [110]

[109] UT Austin. LEED Credit Guide, 33.
[110] UT Austin. LEED Credit Guide, 34.

IEQ Credit 7.2: Thermal Comfort—Verification

Credit anticipated: **1 point**

Requirement: Meet IEQ Credit 7.1, and conduct a survey of thermal comfort among building occupants within 6-18 months post-occupancy. Develop a plan for corrective action should the results of the survey reveal that more than 20% of occupants are dissatisfied with the thermal comfort in the building.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved, and anticipates that the credit will facilitate sustainable operations and may aid in subsequent LEED-EB: OM certification. UT System managed projects have consistently achieved this credit, because it is a UT Austin requirement in the MEP design standards.[111]

IEQ Credit 8.1: Daylight and Views—Daylight

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Provide daylighting in 75% of the regularly occupied spaces, demonstrated through one of four options: Option 1 – Simulation (employ computer simulation to demonstrate that 75% or more of all regularly occupied spaces achieve daylight iluminance levels of min. 25 fc and max. 500 fc on a clear day on September 21 at 9am and 3pm); Option 2 – Prescriptive (calculate the product of visible light transmittance and window-to-floor area ratio, to be between 0.150 and 0.180); Option 3 – Measurement (take indoor light measurements and achieve at least 25 fc in at least 75% of the regularly occupied spaces); Option 4 – Combination of any of the options.

[111] UT Austin. LEED Credit Guide, 34.

Commentary: In the case of Battle Hall and West Mall Building, the library stack area and West Mall Building prevent achieving the threshold percentage. Historic Battle Hall, prior to the addition of West Mall Building covering its west windows, would have most likely achieved this credit. This is true of many historic buildings, which traditionally had oversized windows to allow an abundance of light into the building. This credit will not be pursued on the Battle Hall and West Mall Building project.

UT Austin does not recommend pursuing this credit because buildings at UT Austin are generally mid-rise with relatively low FAR, and are situated in close proximity to each other, therefore in most case sufficient light cannot penetrate to central spaces in the building.[112]

IEQ Credit 8.2: Daylight and Views—Views

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Achieve a direct line of sight to the outdoor for building occupants in 90% of all regularly occupied areas. The direct line of sight is to be accomplished through vision glazing located between 30" and 90" above finish floor, and it may be drawn through interior glazing.

Commentary: This credit will not be pursued on the Battle Hall and West Mall Building renovation project due to the fact that the library stacks as well as other interior spaces at the confluence of Battle Hall and West Mall Buildings do not have a line of sight to the outdoor. Historic Battle Hall, prior to the addition of West Mall Building covering its west windows, would have most likely achieved this credit.

[112] UT Austin. LEED Credit Guide, 35.

UT Austin does not recommend pursuing this credit, for the same reasons as those stated in IEQ Credit 8.1.[113]

A total of **12 points** out of a maximum of 15 are anticipated to be achieved in the IEQ category by the Battle Hall and West Mall Building renovation project under LEED-NC v2009.

[113] UT Austin. LEED Credit Guide, 35.

Innovation and Design Process (ID)

ID Credit 1.1: Innovation in Design

This category allows for a total of 5 points to be achieved, by any combination of points from the following two paths: Path 1 allows a maximum of 5 points as specific Innovation in Design strategies (innovative Green Building performance not specifically addressed by the LEED rating system the project is under); Path 2 allows a maximum of 3 points as Exemplary Performance (exceeding given thresholds listed in certain specific credits). UT Austin recommends pursuing all of the points available in this credit as appropriate for each individual project, and offers for guidance a list of credits that have been successfully achieved or are currently pursued on UT Austin projects.[114] Although these credits were pursued on new construction projects, certain strategies can be implemented just as well on renovation projects. Additionally, the USGBC published an Innovation in Design Credit Catalog in 2008, identifying submittals for ID credits and their approval status.[115] Several of those could be applied on historic preservation projects and could be potential opportunities for the Battle Hall and West Mall Building renovation project; however, since this document was written prior to the release of LEED-NC v2009, the proposed ID credit requirements must be thoroughly checked against regular credits in LEED-NC v2009, to ensure that they have not become a regular credit on the new rating system.

In order to ensure that all 5 Innovation in Design points are achieved on this project, a number of strategies will be proposed in excess of the required 5.

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[114] UT Austin. LEED Credit Guide, 36.

[115] USGBC. 2008. "Innovation in Design Credit Catalog." Last Modified March 2008. http://www.usgbc.org/ShowFile.aspx?DocumentID=3569

ID Credit 1.1: Innovation in Design: Building Interior Maintenance Plan

Credit anticipated: **1 point**

The proposed Building Interior Maintenance Plan will incorporate Green Housekeeping and Integrated Pest Management, based on the requirements of the LEED for Existing Buildings: Operations and Maintenance v2009 rating system.[116]

This ID strategy has been achieved successfully on the AT&T Executive Conference Center on the UT Austin campus,[117] a new construction project, which is cleaned by an outside contractor as opposed to UT Facilities Services.

ID Credit 1.2: Innovation in Design: Building Exterior Maintenance Plan

Credit anticipated: **1 point**

The proposed Building Exterior Maintenance Plan will incorporate green landscape/irrigation maintenance best practices and Integrated Pest Management, based on the requirements of the LEED for Existing Buildings: Operations and Maintenance rating system v2009. [118]

This ID strategy has been achieved successfully on the AT&T Executive Conference Center on the UT Austin campus, a new construction project. [119] This strategy is similar to the Organic Landscaping and IPM Program listed in USGBC's Innovation in Design Credit Catalog, which is obtained through developing an organic landscaping and pest management program that uses risk reduction strategies to limit

[116] USGBC. LEED Reference Guide for Green Building Operations and Maintenance.
[117] UT Austin. LEED Credit Guide, 36.
[118] USGBC. LEED Reference Guide for Green Building Operations and Maintenance.
[119] UT Austin. LEED Credit Guide, 36.

synthetic chemical controls, herbicides and fertilizers, and implementing xeriscape principles.[120]

ID Credit 1.3: Innovation in Design: 95% Construction Waste Management (MRc2 Exemplary Performance)

Credit anticipated: **1 point**

95% Construction Waste Management is the threshold for Exemplary Performance set under MR credit 2.[121]

This ID strategy has been achieved successfully on the Research Office Complex (ROC) and Biomedical Engineering (BME) on the UT Austin campus, which incorporated demolition waste from Student Health Center on the UT Austin campus.[122]

ID Credit 1.4: Innovation in Design: 30% Regional Materials (MRc5 Exemplary Performance)

Credit anticipated: **1 point**

30% Regional Materials is the threshold for Exemplary Performance set under MR credit 5. [123]

This ID strategy has been achieved successfully on the AT&T Executive Conference Center on the UT Austin campus, a new construction project. [124]

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[120] USGBC. "Innovation in Design Credit Catalog."
[121] USGBC. LEED Reference Guide for Green Building Design and Construction.
[122] UT Austin. LEED Credit Guide, 37.
[123] USGBC. LEED Reference Guide for Green Building Design and Construction.
[124] UT Austin. LEED Credit Guide, 37.

ID Credit 1.5: Innovation in Design: Occupant Recycling

Credit anticipated: **1 point**

Based on the USGBC's Innovation in Design Credit Catalog, this ID strategy proposes the implementation of a recycling program that allows occupants to recycle compost, cassette tapes, computer disks, eyeglasses, batteries, or license plates. Building employees will be provided with guidebooks on how to reduce, reuse and recycle, and signs will be posted in visible places to educate the occupants on these practices.[125]

ID Credit 1.6: Innovation in Design: Low VOC Materials – Maintenance Coatings

Credit anticipated: **1 point**

Based on the USGBC's Innovation in Design Credit Catalog, this ID strategy proposes the use of low-VOC cleaning and maintenance products for historic finishes, which either meet or exceed the requirements of South Coast Air Management District Rule 113, in order to reduce installer and occupier exposure to toxic air contaminants.[126] Examples of such products would include masonry cleaners, decorative metal cleaners, paint and coating strippers and solvents, as well as maintenance coatings and paints appropriate for historic finishes.

ID Credit 1.7: Innovation in Design: Educational Program

Credit anticipated: **1 point**

Based on the USGBC's Innovation in Design Credit Catalog, the proposed Educational Program would be accomplished through providing public education focusing on green building strategies and solutions. This path will include at least two of

[125] USGBC. "Innovation in Design Credit Catalog."
[126] USGBC. "Innovation in Design Credit Catalog."

the following three options: Implement a comprehensive signage program in the building that informs visitors about the benefits of green building; Provide an illustrated manual or guidebook to inform future design based on the successes of the building; Develop an educational outreach program or guided tour which focuses on sustainable design using the specific project as an example.[127] This proposed Innovation in Design credit is uniquely suitable for an architectural education building.

ID Credit 1.8: Innovation in Design: Educational Program

Credit anticipated: **1 point**

Based on the USGBC's Innovation in Design Credit Catalog, this Educational Program proposes to offer a full-semester university course covering sustainable design and LEED, while utilizing a well-developed case study.[128] This ID strategy is particularly well suited for the Battle Hall – West Mall Building Renovation project, which are academic buildings in a large university setting and part of the School of Architecture. This would offer a large body of students in the fields of architecture, interior design, historic preservation and sustainability access to the proposed course. Such courses already exist at the UT SOA.

ID Credit 1.9: Innovation in Design: Student Report

Credit anticipated: **1 point**

Based on the USGBC's Innovation in Design Credit Catalog, the Student Report ID strategy proposes to facilitate student and team member education on green building

[127] USGBC. "Innovation in Design Credit Catalog."
[128] USGBC. "Innovation in Design Credit Catalog."

and LEED, and provide an educational experience beyond that of a case study. Students must participate in research, analysis and documentation of specific LEED requirements for the project.[129] In the case of the Battle Hall – West Mall Building project, getting students involved in green building research would be an excellent way for them to interact with their environment, community and each other to come up with unique and informative ways of disseminating information and creating a valuable learning tool.

ID Credit 2: LEED Accredited Professional

Credit anticipated: **1 point**

This credit requires that at least one principal participant on the project team be LEED accredited.[130] UT Austin requires that this credit be pursued, and employs architecture and engineering firms and construction managers that have LEED AP staff assigned to University projects.[131]

All **6 points** available in the ID category are anticipated to be achieved by the Battle Hall and West Mall Building renovation project under LEED-NC v2009.

[129] USGBC. "Innovation in Design Credit Catalog."
[130] USGBC. LEED Reference Guide for Green Building Design and Construction.
[131] UT Austin. LEED Credit Guide, 37.

Regional Priority (RP)

RP Credit 1-4: Regional Priority

The Regional Priority category was created in the LEED 2009 rating systems with the purpose of addressing geographically-specific environmental issues. There are 6 regional priority credits available for the geographical area of Battle Hall – West Mall Building, searchable by entering the zip code of the project (78712) into the LEED-Online tool. These credits are: SS credit 5.1, SS credit 6.1, SS credit 6.2, WE credit 2, EA credit 2 (1%), and MR credit 2 (75%).[132] The project is anticipated to achieve 3 of these credits (SS credit 6.1, WE credit 2 and MR credit 2).

A total of **3 points** out of a maximum of 4 are anticipated to be achieved in the RP category by the Battle Hall and West Mall Building renovation project under LEED-NC v2009.

[132] USGBC. 2012. "Regional Priority Credits". Accessed April 27, 2012. https://www.usgbc.org/RPC/RegionalPriorityCredits.aspx?CMSPageID=24

RESULTS:

The LEED-NC v2009 analysis of the upcoming Battle Hall and West Mall Building renovation project yielded encouraging results. Upon investigation and credit-by-credit analysis, with the aid of the LEED NC v3 – 2009 Credit Guide produced by the Sustainable Facilities Committee, this thesis was able to identify a total of 79 potential points believed to be achievable for the historic building renovation project. Based on these findings, the project would not only earn a solid LEED Gold rating – a goal that the School of Architecture would be very proud to achieve – but it would be only 1 point away of a LEED Platinum rating (80 points or above earns LEED Platinum).

These results are encouraging for historic preservation, as they show that despite being subjected to a rating system not particularly tailored for or favorable to historic buildings, a historic building renovation could still find itself very close to the highest thresholds of LEED certification. These results are also consistent with the findings of Chapter II, where of the 11 historic building renovation projects identified as LEED certified under the 2009 rating system for New Construction and Major Renovations, three had achieved LEED Platinum and five had achieved LEED Gold.

In the LEED-NC v2009 analysis on Battle Hall and West Mall Building, points were distributed as follows between categories:

- Sustainable Sites: 22 points out of a maximum of 26
- Water Efficiency: 9 points out of a maximum of 10
- Energy and Atmosphere: 15 points out of a maximum of 35
- Materials and Resources: 12 points out of a maximum of 14
- Indoor Environmental Quality: 12 points out of a maximum of 15
- Innovation and Design Process: 6 points out of a maximum of 6
- Regional Priority: 3 points out of a maximum of 4

These findings denote that the only category in which the historic building renovation project performed somewhat poorly is the Energy and Atmosphere category, where it earned 15 points out of 35. The points that the Battle Hall and West Mall Building renovation project did not pursue in this category do not have an impact on historic preservation and do not relate to the inherently sustainable qualities of historic buildings. About half of the points that the project missed in this category are split between the On-Site Renewable Energy (7 points) and the Green Power (2 points). The University of Texas at Austin discourages pursuit of these particular points, due to the fact that the campus already has a highly efficient energy plant; harvesting on-site renewable energy would not be more efficient than using the energy produced by the power plant, and purchasing green power does not make economic sense in a context where energy is available. Because these points do not affect historic preservation and do not speak of the positive environmental impacts that historic building reuse has over the environment, this thesis agreed with the University's position.[133]

However, in the matter of materials reuse, which directly correlates with historic preservation, building reuse, and impacts of resource reuse over the environment, this thesis took a different approach and disregarded the University's recommendation for not pursuing Materials Reuse credits on campus projects.[134] This thesis recognized that historic building materials are in many cases superior to contemporary materials, therefore refurbishing and reusing them would contribute to a more sustainable design due to their durability and longevity over contemporary counterparts, as well as for avoiding depletion of resources by using something that has already been extracted.

[133] UT Austin, Credit Guide, 16, 18.
[134] UT Austin, Credit Guide, 21.

LEED-NC v2012 Applied to Battle Hall and West Mall Building Renovation Project

The LEED 2012 analysis of the Battle Hall and West Mall Building project was carried out, and the results are compared to those obtained from the LEED 2009 analysis. The two versions of the rating system are drastically different, which precludes a point-by-point comparison; therefore the only accurate measure for comparison is to subject the same project to the two rating systems and interpret the results.

The LEED-NC v2012 analysis of the Battle Hall and West Mall Building renovation project is based on information gathered from the following sources:

- Battle Hall and West Mall Building feasibility draft drawings prepared by Parsons, the design team for the project, for the University of Texas at Austin;
- LEED-NC v2009 project checklist for the Battle Hall and West Mall Building renovation, prepared by Parsons, was used as reference on credits where parallel comparison between the 2009 and the 2012 version of the rating system was possible, and only on credits where extensive calculations and/or engineering expertise was necessary, which the author of this thesis could not provide;
- LEED-NC v3 – 2009 Credit Guide, prepared by the University of Texas at Austin's Sustainable Facilities Committee to aid design teams working on University projects, discussing each credit as it applies to campus projects with accompanying commentary as to whether the pursuit of the credit is required, recommended or not recommended by the University;
- USGBC's *LEED Rating System 3rd Public Comment Draft*, 2012

  Note: All credit requirements in this analysis are based on the *LEED Rating System 3rd Public Comment Draft*. Separate footnotes will not be used.

Integrative Process

(Integrative Process, originally called “Integrated Process” and introduced as a new category in the LEED 2012 BD+C rating system, was removed as a category from the 3rd Public Comment Draft; the credit was however kept as a stand-alone credit without a category)

Credit: Integrative Process

Credit anticipated: **1 point**

Requirement: Implement a process in which the different disciplines on a project collaborate in synergistic ways to inform decisions made at the Owner’s Project Requirements (OPR), Basis of Design (BOD), Design Development and Construction Documents stages in order to achieve a high-performance design outcome. The analysis is to include, at a minimum, energy and water-related systems, as well as cost analysis in reference to the energy and water-related systems. The documentation for this credit must demonstrate how the process influenced the design outcome.

Commentary: This credit will be achieved for the Battle Hall and West Mall Building renovation project.

Location and Transportation (LT)

LT Prerequisite: Sensitive Land Protection

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: The Battle Hall – West Mall Building project qualifies for Case 1 of this prerequisite, which requires that the development footprint be only on previously developed portions of the site, or that development occurs on a previously developed site.

Commentary: Since the proposed addition to West Mall Building will occupy an area currently paved and dedicated to parking, the requirement of this prerequisite will be met.

LT Credit: LEED for Neighborhood Development Location

Credit anticipated: **0 points** (out of a range of 5-16 points)

Requirement: This credit serves as an alternate compliance path to the entire Location and Transportation category. A project can earn up to a maximum of 16 points by meeting the requirements of this credit, or earn up to a maximum of 16 points by meeting the requirements of the other credits in the Location and Transportation category. This particular credit is only applicable to projects located within a LEED for Neighborhood Development project site, with the number of points earned depending of the level of LEED certification of the particular site.

Commentary: This credit seems to exclude historic properties, unless the neighborhood the historic property is in happens to be certified under the LEED for Neighborhood Development rating system. Since this is an alternate compliance path for

achieving points in this Location and Transportation category, historic projects could still achieve their points under the various the other credits.

The Battle Hall and West Mall Building renovation project will not earn points under this credit.

LT Credit: High Priority Site

Credit anticipated: **2 points** (LEED Interpretation)

Requirement: This credit aims to encourage development in areas with high development constraints by requiring that the project be located either in an infill location in a historic district, or on a brownfield (which must be remediated), or in a difficult development area as identified by various federal agencies listed in the credit.

Commentary: Presumably a historic project located within a historic district would meet the requirements of this credit. A distinction should be made in the language of the credit to indicate if this is intended to only apply to new construction within a historic district, and/or to a renovation within a historic district. The language of the credit itself does not define the term "historic district", but the USGBC offers a glossary of terms for the LEED 2012 3rd Public Comment Draft on their website.[135]

The University of Texas at Austin's "40 Acre" area of the campus would potentially qualify as a historic district, and the major renovation of Battle Hall and West Mall Building project could potentially earn this credit. For the purpose of this thesis, the assumption will be made that the Battle Hall and West Mall Building project will earn the 2 points either by qualifying in a straight-forward fashion as an "infill location in a historic district", or through a LEED Interpretation.

[135] USGBC. "LEED 2012 3rd Public Comment Rating System Glossary".

LT Credit: Surrounding Density and Diverse Uses

Credit anticipated: **6 points**

Requirement: This credit aims to encourage development in areas that are already developed, promoting walkability and transportation efficiency while reducing the vehicle miles traveled (VMT). There are two options for earning points. Option 1: Surrounding Density requires the project be located on a previously developed site that has within a ¼ mile radius of the project boundary a density equal or greater to the following: 7 residential dwelling units/acre or 0.5 non-residential FAR, with a combined density of 22,000 SF/acre (earns 2 points); 12 residential dwelling units/acre or 0.8 non-residential FAR, with a combined density of 35,000 SF/acre (earns 4 points). Option 2: Diverse Uses requires the project be located with its building entrance within ½ mile walking distance of the main entrance of publicly available uses such as convenience store, pharmacy, retail, bank, restaurant, education facility, place of worship, community or recreation center, family entertainment venue, etc. (earns 1 point for 4-7 uses and 2 points for 8+ uses).

Commentary: A maximum of 6 points are available to be earned under this credit, which the Battle Hall – West Mall Building is expected to earn due to its location meeting the requirements of both Option 1 and Option 2.

LT Credit: Quality Transit

Credit anticipated: **3 points** (out of a maximum of 5 points)

Requirement: This credit encourages development in locations with access to multiple forms of public transportation to reduce motor vehicle use and its associated adverse environmental and public health effects. For New Construction and Major Renovations projects there is an Option 1: Transit-Served Location that offers 1-3 points

if the project is located such that any functional entry is within ¼ mile walking distance of bus, streetcar or rideshare stop, or within ½ mile of rapid transit, light/heavy/commuter rail station or ferry terminal. There is no Option 2 listed for NC projects, and it is unclear how 5 points can be earned for NC projects.

Commentary: By virtue of its location, the Battle Hall and West Mall Building project is expected to earn all 3 points available under Option 1.

LT Credit: Bicycle Network, Storage and Shower Rooms

Credit anticipated: **1 point**

Requirement: Provide bicycle storage within 200 yards of a functional building entry such as to provide short-term bicycle storage capacity for 2.5% or more of all building users, and long-term bicycle storage capacity for 5% or more of all building users (in both cases measured at peak periods). Additionally, at least one on-site shower with changing facilities should be provided for the first 100 FTE (full-time equivalent) occupants and one additional shower for every 150 FTE thereafter.

Commentary: These requirements are possible and expected to be achieved for the Battle Hall – West Mall Building project, and the 1 point is anticipated to be earned.

LT Credit: Reduced Parking Footprint

Credit anticipated: **2 points** (LEED Interpretation)

Requirement: Do not exceed minimum local zoning ordinance parking requirements, AND Case 2: Dense and/ or Transit Served Location (compliance path for projects that earned 1 or more points Surrounding Density and Diverse Uses or Quality Transit), reduce parking capacity by 40% (earning 1 point) or 60 % (earning 2 points)

when compared to the recommendations of the Parking Consultants Council (Tables 18-2 through 18-4 in the Institute of Transportation Engineers' Transportation Planning Handbook, 3rd Edition).

Commentary: This credit may be achievable through a LEED Interpretation. It seems that the language of the credit does not address projects that are not adding any new parking, or projects that do not have parking in the first place. The only parking around Battle Hall and West Mall Building currently is the loading dock parking which will be removed to construct the addition to Battle Hall and West Mall Building.

A total of **14 points** out of a maximum of 16 are anticipated to be achieved in the LT category by the Battle Hall and West Mall Building renovation project under LEED-NC v2012.

Sustainable Sites (SS)

SS Prerequisite: Construction Activity Pollution Prevention

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Create and implement an erosion and sedimentation control plan for all construction activities associated with the project, to conform with the current version of the EPA Construction General Permit or local standards and codes, whichever is more stringent.

Commentary: This prerequisite has not changed from the previous version of the LEED rating system. This prerequisite will be achieved on the Battle Hall and West Mall Building project.

SS Credit: Site Assessment

Credit anticipated: **1 point**

Requirement: This is a new credit proposed to be introduced into LEED 2012, adapted from the Sustainable Sites Initiative. Design teams are required to complete a site survey/ assessment with the intent of better informing their decisions on sustainable site design. The assessment is required to consider issues related to topography, hydrology, climate, vegetation, soils, human use and human health impacts, and show how the site features have influenced the project design.

Commentary: Responding to site features such as topography, hydrology and vegetation, and being sensitive about climate, human use and human health impacts, should be integral part of design projects. Additionally, there is an opportunity within this credit to add a requirement under the "human use" assessment that along with the

recycling/reuse of potential existing construction materials on the site, also evaluate the preservation/ rehabilitation/ reuse of existing buildings on the site. This credit is expected to be achieved on the Battle Hall/ West Mall Building project.

SS Credit: Site Development—Protect or Restore Habitat

Credit anticipated: **0 points** (out of a maximum of 2 points)

Requirement: Option1: Onsite Restoration (2 points), restore 30% of the previously developed portions of the site with native or adapted vegetation (may include vegetated roof for projects that achieve a density of 1.5 FAR). Option 2: Financial Support (1 point), provide financial support in the sum of $0.05 per square foot of site (including building footprint) toward land acquisition or management for natural resources, restoration of native habitat, watershed management, restoration or protection, or public urban green space restoration or revitalization.

Commentary: The language of this credit for Option 1 has been revised in the proposed 2012 version of the LEED Rating System as compared to the 2009 version, and an Option 2 has been introduced. The main compliance path for this credit, similar to that in LEED NC v2009, is not achievable for the Battle Hall and West Mall Building due to site constraints. Because of the UT Austin campus density, the Battle Hall and West Mall Building project simply does not have enough space around it to restore with vegetation.

The newly introduced Option 2: Financial Support in the proposed 2012 LEED rating system, which allows a project to earn 1 point under this credit for providing financial support in the sum of $0.05 per square foot of site (including building footprint) toward land acquisition or management for natural resources, restoration of native

habitat, watershed management, restoration or protection, or public urban green space restoration or revitalization, is achievable by any project willing to pay for the point. The Battle Hall and West Mall Building project could earn 1 point for providing such financial support, but that would not reflect on historic building reuse or preservation therefore it will not be considered for this thesis.

SS Credit: Site Development— Open Space

Credit anticipated: **1 point** (LEED Interpretation)

Requirement: Provide open space equal to or greater than 30% of the total site area (including building footprint), and a minimum of 25% of that outdoor space be vegetated, with the intent of promoting physical activity and human interaction.

Commentary: The language of this credit has been revised in the proposed 2012 version of the LEED Rating System as compared to the 2009 version. Previously the credit was divided into 3 cases, of which Battle Hall and West Mall Building project qualified for Case 2, which required vegetated space equal to the building footprint within the project boundaries. In 2012 there are no separate cases, and there is no mention that the open space has to be within the project boundaries, nor that it has to be dedicated as open space into perpetuity.

Battle Hall and West Mall Building are part of an university campus, making it difficult to delineate where the project site boundaries are; however it would appear that for this credit adjacent green space with paved paths and benches, which are already existing on the east side of Battle Hall, could be counted for the 30% open space, with 25% vegetated space. A LEED Interpretation may be used to clarify the requirements. The Battle Hall/ West Mall Building project is expected to achieve this point.

SS Credit: Rainwater Management

Credit anticipated: **0 points** (out of a maximum of 3 points)

Requirement: Option 1 (2 points), manage runoff onsite for 95% or regional or local rainfall events using Low Impact Development (LID) and green infrastructure; or Option 2 (3 points), for which the Battle Hall/ West Mall Building project would have to follow Path 2, manage runoff onsite for 98% or regional or local rainfall events using Low Impact Development (LID) and green infrastructure (Path 1 assumes there is a natural and un-constructed site currently, which is not the case with our project).

Commentary: This credit has changed from the LEED NC v2009 to combine the Stormwater Design – Quality Control and Stormwater Design – Quantity Control credits, dramatically increasing the percentages or rainwater required to be diverted and managed. It is unclear what "manage onsite" in the language of this credit implies. The USGBC needs to further define the terminology for this credit. It sounds from the language of this credit that they only mean capturing of 95% or 98% of the local rainfall, but since the 2009 version of the rating system also had a Quality Control part to this credit, requiring not only capturing but also treating on-site 90% or the rainfall, makes one wonder if this is what the USGBC means here with the term "manage onsite". Further investigation is required. Until such determination is made as to what precisely the USGBC's intention is in regards to this credit, it will be assumed that the Battle Hall and West Mall Building project will not achieve this credit.

SS Credit: Heat Island Reduction

Credit anticipated: **0 points** (out of a maximum of 2 points)

Requirement: There is one formula to meet that encompasses non-roof and roof:

[(Area of Non-roof Measures / 0.5) + (Area of High-Reflectance Roof / 0.75) + (Area of Vegetated Roof / 0.75)] ≥ (Total Site Paving Area + Total Roof Area)

Commentary: This credit has changed from the LEED NC v2009 to combine the Heat Island Effect – Non-roof and the Heat Island Effect – Roof credits, each worth 1 point in 2009, into a single credit comprising both non-roof and roof, worth 2 points (not weighted). For the Battle Hall/ West Mall Building the non-roof area is at this time unknown due to the fact the buildings are part of a university campus and it is unclear where the site boundaries are for this particular project. "Area of Non-roof" may be pretty minimal for this project and therefore not of great consequence in these calculations. "Area of High-Reflectance Roof" on this project, if any, could only be on the flat roof area over the stacks of Battle Hall (3450 SF); the rest of the roof is covered with clay tiles, which are a historical character defining feature of the UT Austin campus buildings, therefore they will remain as such. "Area of Vegetated Roof" is projected to over the one-story addition on the south side of the Battle Hall stacks, with an area of 3450 SF. The Heat Island Reduction formula could potentially look like this:

[(Area of Nonroof Measures / 0.5) + (Area of High-Reflectance Roof / 0.75) + (Area of Vegetated Roof / 0.75)] = (0 / 0.5 + 3450 SF / 0.75 + 3450 SF / 0.75) = 9200 SF

(Total Site Paving Area + Total Roof Area) = 0 + 30,500 SF

9200 SF is not larger or equal to 30,500 SF therefore this credit will not be achieved for the Battle Hall/ West Mall Building project. This is in part due to the large area of roof that is not reflective or vegetative. As a general note, this will likely be an issue for many historic buildings, as it may not be appropriate to replace their historic roofs with reflective or vegetative roofs.

SS Credit: Light Pollution Reduction

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Meet Requirement 1: Uplight and Requirement 2: Tresspass for all exterior lights by using either the BUG rating method or the calculation method.

Commentary: This credit has changed from the 2009 version in that that it has eliminated restrictions for indoor lighting, and has introduced an additional option for measuring uplight rating and percentage of lumens above horizontal. The requirements have also become more prescriptive.

The historical outdoor light fixtures on campus and at the Battle Hall and West Mall Building likely prevent achieving this credit.

A total of **2 points** out of a maximum of 10 are anticipated to be achieved in the SS category by the Battle Hall and West Mall Building renovation project under LEED-NC v2012.

Water Efficiency (WE)

WE Prerequisite: Outdoor Water Use Reduction

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: There are 2 options. Option 1: No Irrigation Required – design team must show that the landscape does not require a permanent irrigation system; Option 2: Reduce Irrigation – irrigation must be reduced by 30% from the calculated baseline for the project site's peak watering month.

Commentary: This prerequisite will be met for the Battle Hall and West Mall Building project.

WE Prerequisite: Indoor Water Use Reduction

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Water consumption from plumbing fixtures must be reduced by 20% from toilets, urinals, lavatory faucets, showerheads and kitchen faucets (excluding those that are used for filling operations).

Commentary: As with the 2009 version, strategies employed to meet the requirements include installation of low-flow lavatories, sinks and shower heads where appropriate; installation of automatic faucet sensors, high-efficiency/ dual-flush water closets and urinals, as well as waterless fixtures where appropriate. Some or all of these strategies may not be appropriate or possible in the case of the historic plumbing fixtures in Battle Hall, which are character defining features. Careful consideration must be given to such issues in historic buildings, so that historic fabric is not unnecessarily sacrificed. Collected rainwater and AC condensate may be used for non-potable uses.

UT Austin Facilities Maintenance must be consulted to determine if "non-traditional" approaches (i.e. waterless urinals, etc.) are allowed. UT Austin requires compliance with this prerequisite.[136]

WE Prerequisite: Building Level-Water Metering

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: install water meters to measure the total potable water usage of the project, as well as to enter into an agreement with the USGBC to share the results for a period of 5 years (or until building ownership changes, if sooner than 5 years).

Commentary: While the previous two prerequisites are more or less derived from the WE prerequisite of the 2009 rating system, this prerequisite is new and it has to do with the introduction of performance measuring and verification requirements into LEED 2012. This prerequisite will be met for the Battle Hall and West Mall Building project.

WE Credit: Outdoor Water Use Reduction

Credit anticipated: **2 points**

Requirement: Building upon the requirement of the first WE prerequisite, a project may earn 2 points under Option 1: No Irrigation Required if no permanent irrigation system is installed; and 1 to 2 points under Option 2: Reduce Irrigation if the project's Landscape Water Requirement (LWR) is reduced by 50% (1 point) or by 100% (2 points) as compared to the calculated baseline for the site's peak watering month.

Commentary: The Battle Hall and West Mall Building project is anticipated to earn 2 points on this credit. Installing landscaping with climate-tolerant plants and using

[136] UT Austin. LEED Credit Guide, 10.

captured rainwater or reclaimed water for irrigation will facilitate meeting the requirements of this credit. The Owner's Project Requirements (OPR) state that native, adapted and xeriscape plant material are to be installed, and turf is to be eliminated where possible, in order to reduce the need for irrigation, while restoring elements of the native landscape from the 1933-1934 campus master plan.[137]

WE Credit: Indoor Water Use Reduction

Credit anticipated: **3 points** (out of a maximum of 6 points)

Requirement: Building upon the requirement of the second WE prerequisite, a project may earn 1-6 points by further reducing its water usage based on the following percentages:

25% reduction – 1 point

30% reduction – 2 point

35% reduction – 3 point

40% reduction – 4 point

45% reduction – 5 point

50% reduction – 6 point

Commentary: UT Austin requires achieving the 30% water use reduction threshold for projects seeking LEED-NC v2009 certification, and recommends pursuing further reduction options to achieve 35% and 40% water use reduction. UT Austin indicates that reducing levels of potable water consumption beyond 30% are difficult to achieve by use of high-efficiency fixtures alone, but they can be achieved by utilizing

[137] UT Austin. OPR.

non-potable water sources available on campus, such as rainwater collection and AC condensate collection, for water closet and urinal flushing.[138]

For this credit, the Battle Hall and West Mall Building project will employ high-efficiency plumbing fixtures as described in WE Prerequisite 1, combined with the use of non-potable water sources for water closet and urinal flushing as recommended by UT Austin.[139] A water use reduction of 35% of the calculated baseline for the building is anticipated, as indicated by Parsons, the design team on the project.[140] Thus the project is expected to earn 3 points out of the maximum of 6 points available for this credit.

WE Credit: Cooling Tower Water Use

Credit anticipated: **2 points** (LEED Interpretation)

Requirement: Conduct a one-time analysis of the potable water used for cooling towers and evaporative condensers on the project, in order to evaluate concentrations of given control parameters and calculate number of cooling tower cycles.

Commentary: The credit is aimed at reducing the amount of potable makeup water used for cooling towers and evaporative condensers. However, the University of Texas at Austin uses a system of recovered water (carried in white or grey-colored pipes) and reclaimed water (carried in purple-colored pipes) rather than potable water in its cooling towers.[141, 142] It appears that the language of this credit excludes and does not reward existing projects that are already doing their job of being environmentally responsible and protecting resources by not using potable water for utilitarian purposes.

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[138] UT Austin. LEED Credit Guide, 12.
[139] UT Austin. LEED Credit Guide, 10.
[140] Parsons. LEED-NC 2009 Project Checklist
[141] http://www.foxnews.com/story/0,2933,555540,00.html (Accessed 3/17/2012)
[142] http://www.utexas.edu/pmcs/dcstandards/divisions/SubgroupAppendices/60220Appendix-WaterRecoveryandReuse.pdf (Accessed 3/17/2012)

The Battle Hall and West Mall Building project could potentially earn this credit through a LEED Interpretation to clarify the language of the credit or to add language that includes projects that already accomplish the requirement of this credit. This thesis will consider this credit requirement met and points earned.

WE Credit: Water Metering

Credit anticipated: **1 point**

Requirement: Install permanent water meters for at least two of the following water subsystems (Irrigation; Indoor plumbing fixtures and fittings; Domestic hot water; Boiler; Reclaimed water; Other process water) in order to determine if they function as designed.

Commentary: This credit goes along with the performance verification provision that have been introduced in 2012 for building energy systems. There is no provision for any measures to be taken if the results are not as intended. This credit is expected to be achieved on the Battle Hall and West Mall Building project.

A total of **8 points** out of a maximum of 11 are anticipated to be achieved in the WE category by the Battle Hall and West Mall Building renovation project under LEED-NC v2012.

Energy and Atmosphere (EA)

EA Prerequisite: Fundamental Commissioning and Verification

Credit anticipated: n/a

This is a prerequisite and it must be met in order for the project to be considered for LEED certification. This prerequisite has changed from LEED-NC v2009, encompassing now, not just the building's energy systems but also water usage, indoor environmental quality, durability, and also extending into systems' operations. The project is required to follow a certain commissioning process (CxP) activities for mechanical, electrical, domestic hot water, and renewable energy systems and assemblies in accordance with ASHRAE guidelines for HVAC&R systems and for exterior enclosures. Projects must engage a commissioning authority (CxA) by the end of the design development phase.

This prerequisite will be achieved on the Battle Hall – West Mall Building project.

EA Prerequisite: Minimum Energy Performance

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Option 1: Whole Building Energy Simulation has a requirement for major renovation projects to achieve 7% improvement in proposed building performance over the baseline building performance, which is calculated in accordance with ANSI/ASHRAE/IESNA Standard 90.1-2010, Appendix G (with errata but without addenda).

Commentary: In the case of existing/ historic buildings undergoing major renovations, there is an argument to be made that the baseline building performance should be the building's actual energy performance, since this data is available, rather than a calculated model which would most likely not accurately depict the actual conditions. Option 2: Prescriptive Compliance: ASHRAE 50% Advanced Energy Design Guide requires compliance with ANSI/ASHRAE/IESNA Standard 90.1-2010 (with errata but without addenda) AND compliance with ASHRAE 50% Advanced Energy Design Guide appropriate for the climate zone of the project as described in Chapter 4: Design Strategies and Recommendations by Climate Zone.

This prerequisite will be achieved on the Battle Hall and West Mall Building renovation project by route of Option 1: Whole Building Energy Simulation.

EA Prerequisite: Building-Level Energy Metering

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: This is a new prerequisite introduced in the 2012 Draft rating system, requiring metering or sub-metering at building level of all energy resources (e.g. electricity, natural gas, chilled water, steam, chilled water, steam, fuel oil, propane, biomass, etc.) AND committing to sharing the results with the USGBC for a period of 5 years from the date a project accepts LEED certification or from date of occupancy, whichever comes first.

Commentary: This prerequisite will be achieved on the Battle Hall and West Mall Building renovation project.

EA Prerequisite: Fundamental Refrigerant Management

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: For an existing building renovation, where reusing existing HVAC&R equipment, the requirement is to complete a comprehensive chlorofluorocarbon (CFC)-based refrigerants phase-out conversion prior to completion of the renovation project.

Commentary: This prerequisite is essentially unchanged from the previous version of the LEED rating system. UT Austin requires compliance with this prerequisite, and additionally it requires that any project that uses chilled water from the campus chilling stations provide a copy of the phase-out commitment and leak-protection plan.

EA Credit: Enhanced Commissioning

Credit anticipated: **6 points**

Requirement: In addition to the requirements of EA Prerequisite: Fundamental Commissioning and Verification, this credit requires the following additional commissioning process activities: Under Option 1: Enhanced Commissioning, a project may earn 4 points by implementing certain activities as they relate to mechanical, electrical, domestic hot water and renewable energy systems and assemblies (including contractor submittal review, requirements to include systems manuals, requirements for operator and occupant training, seasonal testing, review of building operations 10 months after substantial completion, and developing an on-going commissioning plan); Under Option 2: Envelope Commissioning, a project may earn 5 points for meeting the requirements of Option 1 AND additionally commissioning the building's thermal envelope as well according to Option 1; Under Option 3: Monitoring Based

Commissioning a project may earn 5 points for meeting the requirements of Option 1 AND additionally developing a Monitoring-Based Commissioning Process Scope, addressing items such as roles and responsibilities, measurement requirements, limits of acceptable values for measurement results, action plan for correction of operational issues or deficiencies, and requirements for updating the systems manual as appropriate. Additionally there is an Option 4, under which a project may earn 6 points for meeting the requirements of all 3 options above.

Commentary: The University of Texas at Austin‘s position in regards to the Enhanced Commissioning requirements of the LEED-NC v2009 rating system are that the additional reviews of design and submittals as well as following up on building operations will ensure proper systems performance, therefore compliance with this credit is required by the University. Based on the same rationale, it is expected that the University would require compliance with all the options of this credit as it appears in the 2012 Draft rating system. All requirements for the four Options presented on this credit are achievable for the Battle Hall and West Mall Building Renovation project; therefore all 6 points are expected to be achieved.

EA Credit: Optimize Energy Performance

Credit anticipated: **10 points** (out of a maximum of 18 points)

Requirement: Follow one of the 2 compliance paths: Option 1 – Whole Building Energy Simulation (possible 1-18 points); Option 2 – Prescriptive Compliance Path: ASHRAE Energy Design Guide (1-6 points).

Commentary: For projects seeking certification under LEED-NC v2009, UT Austin requires that Option 1 be followed, demonstrating improvement in the proposed

project as compared with baseline building performance. UT Austin sets a threshold of minimum 40% improvement (in 2012 that translates into earning 16 points for 39% or 17 points for 42%) for new construction on campus, but does not set a similar threshold for existing building renovations. The same 16 points on the scale of existing building renovations are achieved by a 36% improvement over the baseline building performance.

Further investigation and whole building energy modeling is necessary in order to determine what percentage improvement and how many points the Battle Hall and West Mall Building project can achieve. The project design team, Parsons, at the feasibility study stage of the project, estimated a 22% improvement (yielding 10 points for 21% and 11 points for 23% improvement) in the proposed building performance as compared with its baseline performance. This thesis will consider the 10 points for 21% improvement for the purposes of this comparison.

EA Credit: Advanced Energy Metering

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Install advanced energy metering (meters that are permanently installed, record at intervals of 1 hour or less, and transmit data to a remote location) for all whole-building energy sources and for any individual energy end-uses that represent 10% or more of total consumption.

Commentary: This credit goes along with the performance verification provision that have been introduced in 2012 for building energy systems. It is unknown how UT Austin would see this requirement, so for the purposes of this thesis this credit will not be considered.

EA Credit: Demand Response

Credit anticipated: **0 points** (out of a maximum of 2 points)

Requirement: Design building and equipment to participate in Demand Response (DR), by means of Case 1: Existing Demand Response Program Available (2 points) or Demand Response Program not yet Available (1 point)

Commentary: This is a newly introduced credit in 2012. It is unknown how UT Austin would see this requirement, so for the purposes of this thesis this credit will not be considered.

EA Credit: Renewable Energy Production

Credit anticipated: **0 points** (out of a maximum of 3 points)

Requirement: Use renewable energy resources to offset building energy costs, calculated by the following formula:

$$\% \text{ renewable energy} = \frac{\text{Equiv. cost usable energy produced by renewable energy system}}{\text{Total building annual energy cost}}$$

Points are awarded as follows: 1 point for 1% renewable energy, 2 points for 5% and 3 points for 10%.

Commentary: UT Austin recommends that if this credit is to be pursued, as it may be on a project by project basis, it is written and bid as an Add Alternate to the construction contract. However, due to the high efficiency of UT's energy system and the small available building footprint, it is unlikely that on-site renewable energy will provide viable savings. Furthermore, UT Austin indicates that the greatest chance to achieve points in this category would be through rooftop photovoltaic panels, but they are costly and can present esthetical concerns; wind levels are too low in Austin for effective

use of wind energy, and solar heating would have only minor impacts on the building energy usage.[143]

In the case of the Battle Hall and West Mall Building, rooftop PV panels are not a feasible option due to the buildings' Spanish clay tile roofs, which are character defining features of the buildings as well as the entire campus. In many cases of historic buildings, rooftop PV panels would not be appropriate and such considerations should be kept in mind. This credit will not be pursued on the Battle Hall and West Mall Building renovation project.

EA Credit: Enhanced Refrigerant Management

Credit anticipated: **1 point**

Requirement: One of two options must be met for compliance with this credit. Option 1 prohibits the use of refrigerants; Option 2 requires selecting refrigerants that minimize or eliminate the emissions of compounds that contribute to ozone depletion and global climate change.

Commentary: This credit is expected to be achieved in the Battle Hall - West Mall Building Renovation project, as construction will take place after 2011 (see below).

UT Austin will require compliance with this credit after 2011 on the Main Campus, as the last remaining chiller using R-12 refrigerant is being retrofitted. After the retrofit, any building using the campus chilled water system will automatically achieve this credit.[144]

[143] UT Austin. LEED Credit Guide, 16.
[144] UT Austin. LEED Credit Guide, 17.

EA Credit: Green Power and Carbon Offsets

Credit anticipated: **0 points** (out of a maximum of 2 points)

Requirement: Engage in a minimum 5-year contract to provide at least 50% to 100% of the project's energy from green energy, carbon offsets, or Renewable Energy Certificates.

Commentary: This credit will not be pursued on the Battle Hall and West Mall Building renovation project. UT Austin disallows this credit, as the highly energy-efficient campus utilities meet 100% of the campus energy needs.[145]

A total of **17 points** out of a maximum of 33 are anticipated to be achieved in the EA category by the Battle Hall and West Mall Building renovation project under LEED-NC v2012.

[145] UT Austin. LEED Credit Guide, 18.

Materials and Resources (MR)

MR Prerequisite: Storage and Collection of Recyclables

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Provide easily accessible designated areas for collection and storage of recyclables to include paper, corrugated cardboard, plastics, metals and glass; in addition to batteries, mercury containing lamps, and electronic waste.

Commentary: Careful consideration must be given to the placement of the collection and storage area in a historic building, as to not adversely affect the historic fabric.

MR Prerequisite: Waste Management Planning

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Develop and implement a Construction and Demolition Waste Management Plan that at a minimum identifies 5 materials to be diverted, details diversion strategies used on site, and specifies a process the contractor will use and where the materials will be taken.

MR Credit: Building Reuse and Whole Building Life Cycle Assessment

Credit anticipated: **4 points**

Requirements: Follow one of 5 options for compliance. Option 1: Historic Building Reuse (4 points) requires maintaining of the building structure, envelope and interior nonstructural elements of a historic building or a contributing building in a historic district; Option 2: Renovation of Abandoned or Blighted Building (4 points)

requires maintaining of a minimum of 50% of the existing building structure, by area ; Option 3: Building and Material Reuse (1-3 points) requires to reuse or salvage building materials found onsite or offsite as a percentage of the project area reused, as follows: 25% (1 point), 50% (2 points) or 75% (3 points); Option 4: Whole Building Life Cycle Assessment (3 points) requires new construction projects to conduct a life cycle assessment and demonstrate a minimum of 10% reduction in at least 3 impact categories; Option 5: Building Reuse with Additions (1-3 points) requires the following calculation:

$$\frac{\text{Reused Surface Area + Life Cycle Assessment Surface Area}}{\text{Existing Surface Area + New Construction Surface Area}} \times 3 = \text{Points Achieved}$$

Commentary: The Battle Hall and West Mall Building project qualifies for Option 1: Historic Building Reuse and will earn 4 points. Additionally, the project would also most likely qualify for Option 3: Building and Material Reuse, for the potential reuse of high quality wood from the original windows in the west wall of Battle Hall (currently covered up by West Mall Building), as well as the library stacks currently on the basement and first floor of Battle Hall (which will be displaced when creating the connection between the two buildings). Unfortunately this credit in the 2012 3rd Public Comment Draft does not allow for pursuing more than one option, even when more than one option applies to the historic renovation project.

MR Credit: Material Life Cycle Disclosure and Assessment

Credit anticipated: **0 points** (out of a maximum of 2 points)

Requirements: Comply with one or more of the following options, for a maximum of 2 points. Option 1: Assessment of Non-structural products (1 point) requires assessing a minimum of 20% by cost of a permanently installed non-structural product and doing a

cradle-to-cradle Environmental Product Declaration (EPD); Option 2: Assessment of Structure and Enclosure (1 point) requires assessing a minimum of 20% by cost of structure and enclosure materials and doing a cradle-to-cradle EPD; Option 3: Multi-Attribute Assessment (1 point) requires assessing a minimum of 50% by cost of permanently installed non-structural products that contributes to either Materials Reuse AND/OR Recycled Content with Extended Producer Responsibility AND/OR Support Local Economy.

Commentary: Although this credit seems well intentioned, there are companies now that produce Environmental Product Declarations and this seems to be the direction that the industry is moving toward, this credit seems to still need more work to refine. The language and the requirements are confusing, making it difficult to assess what UT Austin's position might be toward achieving this credit. Additionally, it is unclear what the impact of this credit might be on historic building renovation projects, and the Materials Reuse attribute in this credit does not seem to be very well phrased where one would understand what it is meant to do. This thesis will consider this credit not achieved.

MR Credit: Responsible Extraction of Raw Materials

Credit anticipated: **0 points** (out of a maximum of 2 points)

Requirements: Use permanently installed new construction materials in the project that meet the responsible extraction criteria, as listed in the Responsible Sourcing of Raw Material (applicable to Mined or Quarried Materials, Bio Based Materials, Other Extracted Materials) for a percentage by cost of 10% (1 point) or 20% and 3 material

types (2 points). This credit excludes products or materials with recycled content, salvaged, reused or refurbished materials.

Commentary: This credit does not generally apply to historic building renovations, unless it involves the new construction materials that may be employed within the project. The responsible extraction protocols require further investigation, but it is commendable that responsible mining is now introduced, in addition to responsible wood sourcing. This thesis will consider this credit not achieved.

MR Credit: Disclosure of Chemicals of Concern

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Use a minimum of 20% by cost of at least 3 building products or materials that meet one of the following options. Option 1: Manufacturer Declared Disclosure; Option 2: Third Party Certified Disclosure. These disclosures must list chemicals of concern.

Commentary: Although more research is necessary, and the credit still needs to be refined, this is a well-intentioned credit and it appears to be achievable. It does not specifically have a bearing on historic building renovation projects, but the credit can be applied to any new material employed in the project. This thesis will consider this credit as one that may be achieved, because the author does not possess sufficient information at this point in order to make a concrete determination.

MR Credit: Avoidance of Chemicals of Concern

Credit anticipated: **0 points** (out of a maximum of 2 points)

Requirement: Use a minimum of 20% by cost of at least 3 building products and material types meeting one of the following options. Option 1: Chemical Avoidance, must use third party certified materials that do not contain intentionally added lead, mercury, cadmium, antimony, hexavalent chromium, perfluorinated compounds, carcinogens over a certain threshold; Option 2: Additional Chemical Avoidance (listing additional chemicals and thresholds).

Commentary: Although more research is necessary, and the credit still needs to be refined, this is a well-intentioned credit and it appears to be achievable. It does not specifically have a bearing on historic building renovation projects, but the credit can be applied to any new material employed in the project. This thesis will consider this credit as one that may be achieved, because the author does not possess sufficient information at this point in order to make a concrete determination.

MR Credit: Construction and Demolition Waste Management

Credit anticipated: **2 points**

Requirement: Option 1: Diversion (1-2 points), Case 1: Projects with Demolition – receive 1 point for 65% heavy materials diversion and 2 points for 65% heavy materials diversion + 15% other materials diversion; Case 2: New Construction Only – receive 1 point for 50% heavy materials diversions and 2 points for 50% heavy materials diversion + 30% other material diversion. Option 2: Reduction of Total Waste Material (2 points) – do not generate more than 2.5 pounds of waste per square foot.

Commentary: The thresholds for achieving this credit have increased from the 2009 version. Although this credit does not directly impact historic preservation, it is applicable to historic building renovation projects, as these projects will likely incur some demolition. Provisions could be introduced in this credit more specifically addressing salvaging building materials, whether historic or not, and precisely what to do with them (the assumption would be that historic materials would likely not be removed from the building, especially when a project could earn 4 points for not removing historic fabric). This credit will be achieved on the Battle Hall and West Mall Building renovation project.

A total of **6 points** out of a maximum of 13 are anticipated to be achieved in the MR category by the Battle Hall and West Mall Building renovation project under LEED-NC v2012.

Indoor Environmental Quality (EQ)

EQ Prerequisite: Minimum Indoor Air Quality Performance

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Meet the minimum ventilation requirements of ASHRAE 62.1-2010; monitor outdoor air intake flow for mechanically ventilated spaces or mixed-mode systems when mechanical ventilation is activated, and monitor carbon dioxide concentration for naturally ventilated spaces or mixed-mode systems when mechanical ventilation is not activated.

EQ Prerequisite: Environmental Tobacco Smoke Control

Credit anticipated: n/a – prerequisite must be met for LEED certification.

Requirement: Prohibit smoking inside the building, and within 25' of entries, outdoor air intakes or operable windows; locate smoking areas more than 25' away from entries, outdoor air intakes and operable windows.

Commentary: UT Austin requires compliance with Option 1 of this prerequisite; smoking inside University buildings is already prohibited, and regulations against smoking on campus have recently been passed.[146]

EQ Credit: Enhanced Indoor Air Quality Strategies

Credit anticipated: **2 points**

Requirement: Option 1 (1 point) requires installing 10' long entryway systems in the direction of travel, exhausting spaces that contain hazardous gasses or chemicals and create negative pressure, installing MERV 13 or higher filters per ASHRAE 52.7-2007,

[146] UT Austin. LEED Credit Guide, 24.

design natural ventilation and mixed mode ventilation per CIBSE. Option 2 (2 points) meet Option 1 and meet one additional requirement (Exterior Contaminant Prevention, Increased Ventilation, Carbon Dioxide Monitoring, Additional Source Control & Monitoring, or Natural Ventilation Room by Room Calculations)

Commentary: This new credit in the 2012 version combines requirements of several 2009 version credits plus additional requirements and options. Based on what was deemed feasible to achieve in the 2009 version in the IEQ category, this credit will be achieved on the Battle Hall and West Mall Building renovation project.

EQ Credit: Low-Emitting Interiors

Credit anticipated: **3 points**

Requirement: This credit in the 2012 version requires more materials to comply with the low-emitting criteria (1. Interior paints and coatings applied on site; 2. Interior adhesives and sealants applied on site; 3. Flooring; 4. Composite wood; 5. Ceilings, walls, thermal and acoustic insulation; 6. Furniture) – yet it offers fewer points than in the 2009 version (3 as opposed to 4).

Commentary: Based on what was deemed feasible to achieve in the 2009 version in the Low-Emitting Materials credits, this credit will be achieved on the Battle Hall and West Mall Building renovation project. UT Austin requires that the Low-Emitting Materials credits be achieved for projects seeking certification under LEED-NC v2009,[147] and it will be assumed that they will continue to require it in 2012 as well.

[147] UT Austin. LEED Credit Guide, 28-31.

EQ Credit: Construction Indoor Air Quality Management Plan

Credit anticipated: **1 point**

Requirement: Develop and implement of an IAQ management plan during construction and pre-occupancy to meet ANSI/SMACNA 008-2008 (Chapter 3), as well as protect on-site installed absorptive materials from moisture damage, and use MERV 8 filters at each return air grill if permanently installed HVAC system is operational during construction (filters to be replaced immediately prior to occupancy).

Commentary: This credit has not changed from the 2009 version, and is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved for projects seeking certification under LEED-NC v2009,[148] and it will be assumed that they will continue to require it in 2012 as well.

EQ Credit: Indoor Air Quality Assessment

Credit anticipated: **2 points**

Requirement: Develop and implement an IAQ management plan after all finishes have been installed and the building has been thoroughly cleaned prior to occupancy, complying with either one of two options. Option 1 – Flush-Out (1 point), could be accomplished through either one of two paths: Path 1 – after construction ends and prior to occupancy, with all finishes installed, perform a building flush-out with 14,000 cubic feet of outdoor air per SF of floor area, at an internal temperature of 60°F and max. RH of 60%; or Path 2 – if occupancy is desired prior to completion of flush-out, the space may be occupied after delivery of 3,500 cubic feet of outdoor air per SF of floor area, and must ventilated after occupancy at a minimum of 0.30 cubic cfm per SF or according to

[148] UT Austin. LEED Credit Guide, 32.

the outside air rate determined in IEQ Prerequisite 1, whichever is greater. Conditions must be maintained until a total 14,000 cubic feet per SF of outside air has been delivered. Option 2 – Air Testing (2 points), Conduct air testing per EPA Compendium of Methods for Determination of Air Pollutants in Indoor Air.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved for projects seeking certification under LEED-NC v2009, and advises that Option 2 – Air Testing is desirable for University projects over the flush-out options, as it minimizes schedule disruptions.[149] Option 2 offers 2 points in 2012. It will be assumed that the University will continue to require compliance with this credit in 2012 as well.

EQ Credit: Thermal Comfort

Credit anticipated: **1 point**

Requirement: Design the HVAC systems and building envelope in accordance with the ASHRAE Standard 55-2010, and demonstrate design compliance in accordance with Section 6.2 documentation.

Commentary: This credit is expected to be achieved on the Battle Hall and West Mall Building project. UT Austin requires that this credit be achieved for projects seeking certification under LEED-NC v2009, and UT System managed projects are consistently accomplishing this; [150] this is a UT Austin requirement in the MEP design standards. It will be assumed that the University will continue to require compliance with this credit in 2012 as well.

[149] UT Austin. LEED Credit Guide, 34.
[150] UT Austin. LEED Credit Guide, 34.

EQ Credit: Interior Lighting

Credit anticipated: **1 point** (out of a maximum of 2 points)

Requirement: Option 1: Lighting Control is same as in 2009: provide individual lighting controls for a minimum of 90% of the building occupants, and lighting system controls be provided for all shared multi-occupant spaces. Option 2: Lighting Quality is newly added and has a series of prescriptive requirements.

Commentary: Option 1 of this credit is anticipated to be achieved on the Battle Hall and West Mall Building project by providing lighting controls for full-time building occupants in the library and offices, as well as lighting controls for classrooms and library spaces and task lighting for library reading room and study areas. Option 2 will not be pursued on the project due to the nature of the requirements.

EQ Credit: Daylight

Credit anticipated: **0 points** (out of a maximum of 3 points)

Requirement: Option 1: Simulation – Spatial Daylight Autonomy (2-3 points), demonstrate that 55% of regularly occupied floor spaces (2 points) and 75% (3 points) achieve a minimum special Daylight Autonomy; Option 2: Simulation – Illuminance Calculations (employ computer simulation to demonstrate that 75% or more of all regularly occupied spaces achieve daylight illuminance levels of 100 lux – 3000 lux on a clear day on September 21 at 9am and 3pm); Option 3 – Measurement (take indoor light measurements and achieve illuminance between 300 and 3000 lux in 75% of the regularly occupied spaces on a clear day on September 21 at 9am and 3pm).

Commentary: In the 2012 version this credit can earn up to 3 points compared to only 1 point in 2009. In the case of Battle Hall and West Mall Building, the library stack

area and West Mall Building prevent achieving the threshold percentage. Historic Battle Hall, prior to the addition of West Mall Building covering its west windows, would have most likely achieved this credit. This is true of many historic buildings, which traditionally had oversized windows to allow an abundance of light into the building. This credit will not be pursued on the Battle Hall and West Mall Building project.

EQ Credit: Quality Views

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: Achieve a direct line of sight to the outdoor for building occupants in 75% of all regularly occupied areas.

Commentary: This credit will not be pursued on the Battle Hall and West Mall Building renovation project due to the fact that the library stacks as well as other interior spaces at the confluence of Battle Hall and West Mall Buildings do not have a line of sight to the outdoor. Historic Battle Hall, prior to the addition of West Mall Building covering its west windows, would have most likely achieved this credit.

EQ Credit: Acoustic Performance

Credit anticipated: **0 points** (out of a maximum of 1 point)

Requirement: This credit requires meeting prescriptive requirements in the following 4 areas: room noise levels, sound isolation performance of constructions, limiting reverberation time and reverberant noise built-up, and paging, masking and sound reinforcement systems.

Commentary: The credit offers an exemption for projects in which historic preservation requirements may interfere with meeting the credit criteria; however the

exemption still requires the project to comply with 3 out of the 4 requirements, which may still be difficult to achieve due to the prescriptive nature of the requirements. This credit will not be achieved on the Battle Hall and West Mall Building project.

A total of **10 points** out of a maximum of 16 are anticipated to be achieved in the EQ category by the Battle Hall and West Mall Building renovation project under LEED-NC v2012.

Innovation (IN)

This category allows for a total of 5 points to be achieved, by any combination of points from the following three paths: 1 point can be achieved through Option 1: Innovation; 1 point through Option 2: Pilot Credit; and up to 3 points through Option 3: Additional Strategies (these strategies could be Innovation for 1-3 points, Pilot Credit for 1-3 points, or Exemplary Performance for 1-2 points).[151]

On the Battle Hall and West Mall Building project, all Innovation and Exemplary Performance points proposed for the 2009 version will also be applied to the 2012 version, but they will not be repeated here. In order to ensure that all the points in this category are achieved, a higher number of credits are proposed than points available.

Additionally, one Pilot Credit from the Pilot Credit Library point will be proposed for the 2012 analysis of the Battle Hall and West Mall Building project.[152]

IN Credit: Pilot Credit 14 – Walkable Project Site

Credit anticipated: **1 point**

Requirement: The project must have a principal entry on the front façade facing a public space and connected to sidewalks; street frontages must have a minimum building-height-to-street centerline ratio of 1:1.5 measured to the centerline of the street; off street parking lots located at the side or rear of building; continuous sidewalks all around and connecting to the entrances; no more than 20% of street frontage should face directly a

[151] USGBC. LEED Rating System 3rd Public Comment Draft

[152] USGBC. "LEED Pilot Credit Library". http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2104 (Accessed 4/30/2012.)

garage or service bay opening; no more than 40% of façade facing street is blank; trees between vehicle driving and walkway.[153]

Commentary: The Battle Hall and West Mall Building already meets all of the requirements of the Walkable Project Site pilot credit, therefore this credit will be achieved.

IN Credit: LEED Accredited Professional

Credit anticipated: **1 point**

This credit requires that at least one principal participant on the project team be LEED accredited. UT Austin requires that this credit be pursued, and employs architecture and engineering firms and construction managers that have LEED AP staff assigned to University projects.[154]

All **6 points** available in the ID category are anticipated to be achieved by the Battle Hall and West Mall Building renovation project under LEED-NC v2012.

[153] USGBC. "LEED Pilot Credit Library. Pilot Credit 14: Walkable Project Site." http://www.usgbc.org/ShowFile.aspx?DocumentID=8189 (Accessed 4/30/2012)
[154] UT Austin. LEED Credit Guide, 37.

Regional Priority (RP)

RP Credit: Regional Priority

There is no indication in any of the LEED 2012 drafts as to what the regional priority credits might be, but four credits are listed, which is the same number as in 2009. A project earns points in the Regional Priority category if any of the identified regional priority credits are achieved, up to a total of 4 points. Six Regional Priority credits apply under the LEED-NC v2009 to the Austin, TX region where this thesis' case study of Battle Hall and West Mall Building is located. However none of those credits remain in their original form in the proposed 2012 draft, therefore it is assumed that the USGBC will reevaluate and reassign the Regional Priority points.

Without more accurate information, this thesis will assume that the Battle Hall and West Mall Building will earn the same number of points in the Regional Priority under the 2012 version of the rating system as under the 2009, therefore 3 points will be considered achieved.

A total of **3 points** out of a maximum of 4 are anticipated to be achieved in the RP category by the Battle Hall and West Mall Building renovation project under LEED-NC v2012.

RESULTS:

The LEED-NC v2012 analysis of the upcoming Battle Hall and West Mall Building renovation project resulted in a higher than anticipated score. The credit-by-credit analysis referenced the LEED credit discussion document produced by the Sustainable Facilities Committee for projects seeking certification under LEED-NC v2009, on credits that had reciprocal versions in both rating systems. This thesis was able to identify a total of 67 potential points believed to be achievable for the Battle Hall and West Mall Building renovation project. Based on these findings, the project would earn LEED Gold rating under the LEED-NCv2012, although with far less points than it would earn under the LEED-NC v2009.

The results are encouraging for historic preservation under the LEED 2012 3rd Public Comment Draft for New Construction and Major Renovation. With the 2012 proposed version, the rating system underwent dramatic changes as compared to the current format. Some of these changes are favorable to historic preservation, such as credits that for the first time specifically address the preservation, rehabilitation and reuse of historic buildings, or infill within historic districts; and some less so, with the addition of numerous stringent and prescriptive requirements for compliance, making it difficult for any project – not just a historic building renovation project – to achieve those particular points, or making the research time- and cost-prohibitive. It will be interesting to track the changes once again in the upcoming 4th Public Comment Draft, and see where the stakeholders' comments have been focused. Still, the number of credits and points that are favorable to, and achievable by, historic preservation and historic building reuse projects, even without being specifically tailored to such projects, outweighed the value of the ones that are not favorable.

In the LEED-NC v2012 analysis on Battle Hall and West Mall Building, points were distributed as follows between categories:

- Integrative Process: 1 point out of a maximum of 1
- Location and Transportation: 14 points out of a maximum of 16
- Sustainable Sites: 2 points out of a maximum of 10
- Water Efficiency: 8 points out of a maximum of 11
- Energy and Atmosphere: 17 points out of a maximum of 33
- Materials and Resources: 6 points out of a maximum of 13
- Indoor Environmental Quality: 10 points out of a maximum of 16
- Innovation and Design Process: 6 points out of a maximum of 6
- Regional Priority: 3 points out of a maximum of 4

In 2012, points in the Energy and Atmosphere category are easier to achieve by a historic building renovation than in the previous version, as the threshold percentages of improvement over the baseline energy performance have become more relaxed; more points are awarded in 2012 than in 2009 for the same percentage reduction. The Enhanced Commissioning also sees more points awarded, while the points for Renewable Energy and Green Power have decreased. These changes have made it easier than before for the Battle Hall and West Mall Building project to earn points in this category. The decrease in points for the Battle Hall and West Mall Building project in the 2012 has come in the Sustainable Sites and Materials and Resources categories, with the addition of more stringent requirements in Sustainable Sites, and the addition of new credits to replace the old ones in Materials and Resources, with requirements that necessitate a thorough research of environmental declarations and responsible sourcing.

Chapter IV

INTERPRETATION OF THE RESULTS

The Battle Hall and West Mall Building renovation project underwent parallel analyses under the current LEED 2009 for New Construction and Major Renovations rating system, and under the proposed LEED 2012 3rd Public Comment Draft for New Construction and Major Renovations rating system. The analyses revealed that the historic renovation project has the potential of achieving high ratings under both versions of the LEED rating system, despite the fact that the LEED rating system is not specifically tailored to historic building renovation projects. In LEED-NC v2009, the project has a potential of achieving 79 points, representing a solid LEED Gold rating, one point away from a LEED Platinum rating, which is the highest LEED green building certification level. In LEED-NC v2012 the project has a potential of achieving 67 points, a lower score than in 2009, but still yielding a LEED Gold certification.

The analyses of the Battle Hall and West Mall Building renovation project aid in the comparison of the two versions of the rating system relative to their effectiveness on historic building renovation projects. The two versions of the rating system are significantly different; therefore the two analyses give the comparison a common frame of reference.

The lower score obtained in the LEED 2012 analysis is due to overall more stringent credit requirements and a plethora of prescriptive requirements introduced in the proposed new draft. The inability to achieve those points offsets the benefits that the historic building-specific credits have brought to the new rating system. It is the hope of the author that the USGBC reconsiders some of the prohibitively prescriptive requirements in their upcoming 4th Public Comment Draft.

CONCLUSIONS

The changes from LEED 2009 to LEED 2012 3rd Public Comment Draft for New Construction and Major Renovation are favorable to historic preservation and building reuse, in that that the USGBC has started to take into consideration the beneficial effects that entire building reuse, more so than just materials reuse, has on the environment. The 3rd Public Comment Draft of the LEED 2012 for New Construction and Major Renovation rating system has introduced credits specifically addressing historic building reuse, discouraging the demolition of historic buildings, and promoting infill within historic districts. The proposed LEED draft brings favorable changes and the industry is certainly moving in the right direction, however there is still much that can be done toward awarding historic preservation, rehabilitation and adaptive reuse the full credit they deserve. There are still an abundance of LEED credits where provisions for historic preservation could easily be introduced to promote an even more holistic approach than what the USGBC is proposing.

This thesis recommends a series of modifications to the proposed LEED 2012 3rd Public Comment Draft for New Construction and Major Renovations, to further promote historic preservation, rehabilitation and reuse of historic buildings as environmentally responsible practices. The intent is for these modifications to raise the incentive for building owners and developers to invest in the existing building stock by taking on rehabilitation and reuse projects. These recommendations, discussed in detail in Chapter II, are as follows:

IP Credit: Integrative Process

The recommendation is for this credit to become a prerequisite to ensure compliance, and add a requirement within the prerequisite to analyze the feasibility of adaptively reusing an existing building of comparable size, or adding on to an existing

building. Cost, energy and water systems comparison between the new construction and the adaptively reused existing building would be part of this prerequisite.

LT Prerequisite: Sensitive Land Protection

As part of this prerequisite, Case 1. requires locating development footprint on previously developed portions of the site, and the recommendation is to also include adaptively reusing an existing historic building under Case 1.

LT Credit: High Priority Site

The recommendation is that, along with developing an infill location within a historic district or a brownfield, the USGBC should also introduce the option of developing an existing historic building or existing building within a historic district.

SS Credit: Site Assessment

The recommendation is for this credit to become a prerequisite, which along with the recycling or reuse of potential existing construction materials on the site, would also require evaluating the rehabilitation and reuse of existing buildings on the site.

EA Credit: Optimize Energy Performance

The recommendation is that instead of modeling the baseline energy performance for existing buildings based on ASHRAE, the actual energy use of the existing building is used as baseline.

MR Credit: Building Reuse and Whole Building Life Cycle Assessment

The recommendation is to allow the concurrent application of more than one option within this credit, if more than one option is applicable to the historic building renovation project, and allow points to be earned cumulatively if more than one option is used.

EQ Credit: Acoustic Performance

The recommendation is to offer historic building renovation projects more flexibility with the exemption, allowing non-compliance if documentation is provided that compliance will interfere with the historic character of the building, or offer an alternative path for compliance.

The green building industry in general, with the USGBC and LEED green building certification program in particular, have come a long way from where they started. It is commendable that the USGBC takes public opinion into consideration, and the changes in the LEED rating systems, observed through the evolution of recent drafts and periods of public comment, clearly reflect that. It is also commendable that the USGBC is open to working with groups such as the Sustainable Preservation Coalition, to further their goals of stewardship of the environment and stewardship of our cultural and historical resources. The changes regarding historic preservation and historic building reuse in the LEED rating system are indeed progressing in the right direction, and it is interesting to see where they will lead. The author of this thesis is looking forward to the future of historic preservation and that of the green building certification program, as a potential partnership in promoting the renovation and reuse of our existing historical building stock.

Appendix

LEED 2009 for New Construction and Major Renovations Project Checklist, Battle Hall and West Mall Building Renovation, University of Texas at Austin, 4/30/2012

LEED 2012 for New Construction and Major Renovations Project Checklist, Battle Hall and West Mall Building Renovation, University of Texas at Austin, 4/30/2012

LEED 2009 for New Construction and Major Renovations

Project Checklist

Battle Hall and West Mall Building Renovation, University of Texas at Austin

4/30/2012 LEED Gold

Y	?	N			
22	0	4	Sustainable Sites	Possible Points:	**26**
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
1			Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
		1	Credit 6.2	Stormwater Design—Quality Control	1
1			Credit 7.1	Heat Island Effect—Non-roof	1
		1	Credit 7.2	Heat Island Effect—Roof	1
1			Credit 8	Light Pollution Reduction	1
9	0	1	Water Efficiency	Possible Points:	**10**
Y			Prereq 1	Water Use Reduction—20% Reduction	Required
4			Credit 1	Water Efficient Landscaping	2 to 4
2			Credit 2	Innovative Wastewater Technologies	2 to 4
3		1	Credit 3	Water Use Reduction	2 to 4
15	0	20	Energy and Atmosphere	Possible Points:	**35**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Fundamental Refrigerant Management	Required
8		11	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
3			Credit 5	Measurement and Verification	3
		2	Credit 6	Green Power	2
12	0	2	Materials and Resources	Possible Points:	**14**
Y			Prereq 1	Storage and Collection of Recyclables	Required
2		1	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
2			Credit 3	Materials Reuse	1 to 2
2			Credit 4	Recycled Content	1 to 2
2			Credit 5	Regional Materials	1 to 2
1			Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

12	0	3	Indoor Environmental Quality	Possible Points:	**15**
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
1			Credit 1	Outdoor Air Delivery Monitoring	1
		1	Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
		1	Credit 8.1	Daylight and Views—Daylight	1
		1	Credit 8.2	Daylight and Views—Views	1
6	0	0	Innovation in Design	Possible Points:	**6**
1			Credit 1.1	Innovation in Design: Building Interior Maintenance Plan	1
1			Credit 1.2	Innovation in Design: Building Exterior Maintenance Plan	1
1			Credit 1.3	Innovation in Design: 95% Construction Waste Management	1
1			Credit 1.4	Innovation in Design: Educational Program	1
1			Credit 1.5	Innovation in Design: Student Report	1
1			Credit 2	LEED Accredited Professional	1
3	0	1	Regional Priority Credits	Possible Points:	**4**
1			Credit 1.1	Regional Priority: SS c6.1	1
1			Credit 1.2	Regional Priority: WE c2	1
1			Credit 1.3	Regional Priority: MR c2	1
		1	Credit 1.4	Regional Priority: SS c5.1, SS c6.2, EA c2	1
79	0	31	Total	Possible Points:	**110**

Certified 40-49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110 points

LEED 2012 for New Construction and Major Renovations

Project Checklist

Battle Hall and West Mall Building Renovation, University of Texas at Austin

4/30/2012 LEED Gold

Y	?	N			
1			Credit 1	Integrative Process	**1**
14	0	2	Location and Transportation	Possible Points:	**16**
Y			Prereq 1	Sensitive Land Protection	Required
			Credit 1	LEED for Neighborhood Development Location	5 to 16
2			Credit 2	High Priority Site	2
6			Credit 3	Surrounding Density and Diverse Uses	1 to 6
3		2	Credit 4	Quality Transit	1 to 5
1			Credit 5	Bicycle Network, Storage, and Shower Rooms	1
2			Credit 6	Reduced Parking Footprint	1 to 2
2	0	8	Sustainable Sites	Possible Points:	**10**
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
		2	Credit 2	Site Development—Protect or Restore Habitat	1 to 2
1			Credit 3	Site Development—Open Space	1
		3	Credit 4	Rainwater Management	1 to 3
		2	Credit 5	Heat Island Reduction	2
		1	Credit 6	Light Pollution Reduction	1
8	0	3	Water Efficiency	Possible Points:	**11**
Y			Prereq 1	Outdoor Water Use Reduction	Required
Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
2			Credit 1	Outdoor Water Use Reduction	1 to 2
3		3	Credit 2	Indoor Water Use Reduction	2 to 6
2			Credit 3	Cooling Tower Water Use	1 to 2
1			Credit 4	Water Metering	1
17	1	15	Energy and Atmosphere	Possible Points:	**33**
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
6			Credit 1	Enhanced Commissioning	4 to 6
10		8	Credit 2	Optimize Energy Performance	1 to 18
	1		Credit 3	Advanced Energy Metering	1
		2	Credit 4	Demand Response	1 to 2
		3	Credit 5	Renewable Energy Production	1 to 3
1			Credit 6	Enhanced Refrigerant Management	1
		2	Credit 7	Green Power and Carbon Offsets	1 to 2

6	7	0	Materials and Resources		Possible Points:	**13**
Y			Prereq 1	Storage and Collection of Recyclables		Required
Y			Prereq 2	Waste Management Planning		Required
4			Credit 1	Building Reuse and Whole Building Life Cycle Assessment		1 to 4
	2		Credit 2	Material Life Cycle Disclosure and Assessment		1 to 2
	2		Credit 3	Responsible Extraction of Raw Materials		1 to 2
	1		Credit 4	Disclosure of Chemicals of Concern		1
	2		Credit 5	Avoidance of Chemicals of Concern		1 to 2
2			Credit 6	Construction and Demolition Waste Management		1 to 2
10	1	5	Indoor Environmental Quality		Possible Points:	**16**
Y			Prereq 1	Minimum Indoor Air Quality Performance		Required
Y			Prereq 2	Environmental Tobacco Smoke Control		Required
2			Credit 1	Enhanced Indoor Air Quality Strategies		1 to 2
3			Credit 2	Low-Emitting Interiors		1 to 3
1			Credit 3.1	Construction Indoor Air Quality Management Plan		1
2			Credit 3.2	Indoor Air Quality Assessment		1 to 2
1			Credit 4	Thermal Comfort		1
1		1	Credit 5	Interior Lighting		1 to 2
		3	Credit 6	Daylight		1 to 3
		1	Credit 7	Quality Views		1
	1		Credit 8	Acoustic Performance		1
6	0	0	Innovation		Possible Points:	**6**
1			Credit 1.1	Innovation		1
1			Credit 1.2	Pilot Credit		1
3			Credit 1.3	Additional Strategies		1 to 3
1			Credit 2	LEED Accredited Professional		1
3	0	1	Regional Priority Credits		Possible Points:	**4**
1			Credit 1.1	Regional Priority: Specific Credit		1
1			Credit 1.2	Regional Priority: Specific Credit		1
1			Credit 1.3	Regional Priority: Specific Credit		1
		1	Credit 1.4	Regional Priority: Specific Credit		1
67	9	34	Total		Possible Points:	**110**

Certified 40-49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110 points

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