Department of Defense
Legacy Resource Management Program

09-451

A Case Study for Preserving a Department of Defense Historic Building and Achieving LEED Certification for a Major Renovation Project Indiana Army National Guard Stout Field, Building 5

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March 2011

EXECUTIVE SUMMARY

This project was funded by the Department of Defense (DoD) Legacy Program to determine, through a case study, if it is feasible to renovate a DoD historic building to achieve Leadership in Energy and Environmental Design (LEED) Silver certification AND preserve the historic integrity of the building. This feasibility study involved military and industry experts in a major renovation scenario to develop strategies to explore whether preservation, sustainability, and energy conservation goals could be achieved, and then to determine the costs, benefits, and tradeoffs of doing so.

The DoD must achieve greater goals of energy efficiency improvements in both existing and new facilities. The DoD is directed to advance national energy security and environmental performance through achieving several goals including reducing energy intensity, petroleum consumption in fleet vehicles, greenhouse gas emissions, water consumption, and the use of hazardous chemicals and toxic materials. Building renovations must be conducted in accordance with sustainability strategies, including resource conservation, reduction, and use; siting; and indoor environmental quality. The reuse of an existing building maximizes resource conservation. Historic buildings, therefore, are inherently sustainable because their preservation maximizes the use of existing materials and infrastructure, reduces waste, and preserves the historic character of older installations.

The building offered for this study is the Indiana Army National Guard (INARNG), Indianapolis Stout Field Building 5. Building 5 was built in 1941 from designs of Indianapolis architect John P. Parrish as a National Defense Project funded by the federal New Deal Work Projects Administration. Building 5 is a simple massed plan monolithic concrete structure comprising a three-story central block surmounted by a steel and glass control tower flanked by two-story wings. This building is currently unoccupied and, at the beginning of this study, was to be renovated for office use by INARNG in 2010–11.

There are seven principle LEED credits applicable to the Building 5 analysis (table 4-1): (1) Sustainable Sites, (2) Water Efficiency, (3) Energy and Atmosphere, (4) Materials and Resources, (5) Indoor Environmental Quality, (6) Innovation in Design, and (7) Regional Priority. Individual LEED credits for Building 5 were analyzed and discussed by INARNG and other professionals during a charrette.

Two strategies were developed to achieve LEED Silver certification and minimize impacts to the historic structure. Both groups achieved 61 to 65 points in separate analytical approaches; LEED Silver certification requires 50 to 59 points. The easiest credits to identify and enjoin into Building 5 renovation in terms of design and cost include: Site Selection; Alternative Transportation – Parking Capacity and Low-emitting and Fuel Efficient Vehicles; Site Development – Protect or Restore Habitat and Maximize Open Space; Stormwater – Quantity Control; Water Efficient Landscaping; Green Power; Material Reuse; Recycled Content; Regional Materials; Low-emitting Materials – Adhesives and Sealants, Paints and Coatings, Flooring Systems, and Composite Wood and Agrifiber Products; and LEED Accredited Professional. These easy-to-achieve project elements total approximately 27 LEED prerequisites and points or half the points required for LEED Silver certification.

The more difficult LEED credits to achieve are considered more challenging because they would add additional design and construction requirements to the project, and therefore increase the cost of the renovation. These more difficult to design and construct expensive project elements total approximately 41 LEED prerequisites and points and would include items such as fundamental and enhanced commissioning, increased ventilation, enhanced refrigerant management, material reuse, and designing for thermal comfort. It was estimated that achieving LEED Silver would cost approximately $403,200 total, or 9% over the cost of standard renovation; however, comparable Recurring Life Cycle Costs

(Average Estimated Energy Costs and Life Cycle Costing) over 25 years would result in a 1% savings ($172,250).

This feasibility study supports the theory that achieving LEED Silver certification and having no adverse effect under Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (preserving the historical integrity) to Building 5 is achievable (not considering Antiterrorism Force Protection constraints), both from sustainability and economic perspectives.

For INARNG, the report provides project-specific data and strategies for achieving LEED certification, and assisting with Section 106 of the NHPA consultation. For DoD in general, this document presents the feasibility and cost analysis for combining LEED certification and historic preservation goals and policies; and lessons learned and recommendations to be carried forward in other DoD construction, planning, and cultural resources management projects.

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ABBREVIATIONS AND ACRONYMS

ABA	Architectural Barriers Act of 1968, as amended
ACHP	Advisory Council on Historic Preservation
ADA	Americans with Disabilities Act of 1990, as amended
APE	Area of Potential Effect
ATFP	Antiterrorism Force Protection
BTU	British Thermal Unit
CFR	Code of Federal Regulations
CRM	Cultural Resource Manager
DHPA	Department of Historic Preservation and Archaeology
DoD	Department of Defense
DOE	Department of Energy
ESPC	Energy Savings Performance Contracts
FEMP	Federal Energy Management Program
FOIA	Freedom of Information Act
FTE	Full-time Equivalent
FY	Fiscal Year
GAO	General Accounting Office
GHG	Greenhouse Gas Emissions
GSA	General Services Administration
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HAL	Historic American Landscape Survey
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilation, and Air-Conditioning
INARNG	Indiana Army National Guard
LCC	Life Cycle Costing
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
MILCON	Military Construction
MOA	Memorandum of Agreement
MPR	Minimum Program Requirements
NHPA	National Historic Preservation Act of 1966, as amended
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
OMB	Office of Management and Budget
POC	Point of Contact
PWA	Public Works Administration
RQAW	RQAW Consulting Engineers and Architects
SDD	Sustainable Design and Development
SHPO	State Historic Preservation Office/Officer
sq ft	Square Feet
TAT	Transcontinental Air Transport
THPO	Tribal Historic Preservation Officer
UFC	Unified Facilities Criteria
USC	United States Code
USGBC	U.S. Green Building Council
USPFO	U.S. Property and Fiscal Office
WPA	Work Projects Administration

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1.0 INTRODUCTION AND METHODOLOGY

The Department of Defense (DoD) owns or manages over 340,000 buildings in the United States and its territories. By 2015, approximately 140,000 will reach the age of 50 years old. Buildings owned by the federal government that are 50 years of age or older are subject to requirements of the National Historic Preservation Act of 1966, as amended through 2000 (NHPA) (16 *United States Code* [USC] 470-470W), for the management and preservation of these historic properties. Executive Order 13287: *Preserve America* and Executive Order 11593: *Protection and Enhancement of the Cultural Environment* direct the DoD to protect and to continue the use of its historic buildings (see appendix A). Other federal statutes, regulations, and guidance establish requirements for sustainability and increased energy efficiency for DoD buildings. Department of the Army Memorandum: Sustainable Design and Development Policy Update – SPiRiT to LEED Transition, 5 January 2006 Department of the Army Memorandum: Sustainable Design and Development Policy Update – Life Cycle Costs, 27 April 2007, established goals for vertical construction projects to achieve the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Green Building rating system silver certification levels. The DoD must achieve greater goals of energy efficiency improvements in both existing and new facilities. Although preserving historic buildings and achieving DoD sustainability initiatives often seem to be in opposition to each other, reusing historic buildings maximizes the use of existing materials and infrastructure, reduces waste, and preserves the historic legacy of an installation or base.

This project was awarded through the DoD Legacy Program to determine, through a case study, if it is feasible to renovate a DoD historic building to achieve LEED Silver certification AND preserve the historic integrity of the building. This feasibility study involved military and industry experts in a major renovation scenario to develop strategies for achievable goals and to explore whether preservation, sustainability, and energy conservation goals could be achieved, and then to understand the costs, benefits, and tradeoffs of doing so.

The building offered for this study is the Indiana Army National Guard (INARNG), Indianapolis Stout Field Building 5. Building 5 was built in 1941 from designs of Indianapolis architect John P. Parrish as a National Defense Project funded by the federal New Deal Work Projects Administration (WPA). Building 5 is a simple massed plan monolithic concrete structure comprising a three-story central block surmounted by a steel and glass control tower flanked by two-story wings (see figure 4-1). This building is currently unoccupied and, at the beginning of this study, was to be renovated for office use by INARNG in 2010 and 2011. Although the building program has since changed, the LEED strategy developed for this study is still applicable to the new plans for Building 5.

This feasibility study supports the theory that achieving LEED Silver certification and having no adverse effect under Section 106 of the NHPA (preserving historical integrity) to Building 5 is achievable from both from sustainability and economic perspectives. This report provides project-specific data and strategies for achieving LEED Silver certification for Building 5. This information can be used by the INARNG and the architectural team during design of the renovation as a decision-supporting document and a road map if LEED certification is to be pursued in actual renovation of the building. For DoD, this document presents the feasibility and cost analysis for combining LEED certification and historic preservation goals and policies; and lessons learned and recommendations to be carried forward in other DoD construction, planning, and cultural resources management projects.

1.1 ORGANIZATION OF THE REPORT

This document is divided into five chapters. The first three chapters are for those considering a similar project involving the renovation of a historic building and achieving LEED certification or self-certification. Chapter 1 provides the background and acknowledgements for project goals. Chapter 2 describes DoD policies and requirements applicable to renovation projects for historic buildings and provides an overview of the LEED rating system. Chapter 3 provides considerations for DoD projects involving the renovation of historic buildings. Chapter 4 describes the case study, methodologies employed during the case study, the LEED strategy for the case study building, cost estimates for implementing the strategies, and a comparative study of the options. Chapter 5 provides the references used in this report and case study. The document includes appendices containing additional materials relevant to the report and study.

1.2 ACKNOWLEDGEMENTS

The INARNG endorsed this DoD Legacy Program project and allowed a significant portion of the project to be conducted on its grounds. Ms. Kari Carmany-George, INARNG Cultural Resource Manager (CRM), served as the technical point of contact (POC), providing valuable assistance, guidance, and reviews throughout the project. A number of other people provided additional support without which this project could not have been completed. They participated in the charrette, provided data and services, and reviewed the report. They include:

- Mark Swain, INARNG Plant (Facility) Manager
- Roger Bricker, INARNG Energy Manager
- Jim O'Brien, INARNG Project Manager / Facilities Engineering
- Bob Taylor, INARNG Antiterrorism Force Protection (ATFP) Expert
- Nathan Eaton, INARNG Planning Office/GIS
- Bob Atnip, INARNG Master Planner
- Chad Slider, Indiana Division of Historic Preservation and Archaeology / State Historic Preservation Office (SHPO)
- David Duvall, Indiana Division of Historic Preservation and Archaeology / SHPO
- Mac Williams, Indiana Chapter of USGBC Representative / LEED Architect – Inverde
- Sanjay Patel, RQAW Consulting Engineers and Architects (RQAW) / Renovation / Architectural Design
- James Smith, RQAW / Renovation / Architectural Design
- Charissa Durst, Hardlines Design / Historic Building LEED Strategies
- Melissa Tupper, RTM Consultants, Inc. / Building Codes Expertise
- Sarah Schill, Charrette Support (contractor)

2.0 DOD POLICIES, BUILDING REQUIREMENTS, AND THE LEED PROCESS

2.1 DOD POLICIES AND REQUIREMENTS

Military leaders, planners, designers, environmental compliance specialists, and contractors are responsible for integrating and complying with numerous complex laws, regulations, policies, and guidance into their respective operations and programs. Appendix A provides a brief summary of the key laws, regulations, executive orders, policies, and guidance applicable to this case study and other DoD major renovation projects. For this project, they include:

- Executive Order 13287: Preserve America (3 March 2003)
- Executive Order 13327: Federal Real Property Asset Management (4 February 2004)
- Executive Order 11593: Protection and Enhancement of the Cultural Environment (13 May 1971)
- Energy Independence and Security Act of 2007
- Executive Order 13423: Strengthening Federal Environmental, Energy, and Transportation Management (29 March 2007)
- Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding, OMB Circular A-11
- Department of Defense Policies, Plans, Memorandum, and Guidance
- 2007 Defense Installations Strategic Plan
- Unified Facilities Criteria, DoD Minimum Antiterrorism Standards for Buildings, UFC 4-010-01, 8 October 2003, Including Change 1, 22 January 2007
- Department of the Army Memorandum: Sustainable Design and Development Policy Update – SPiRiT to LEED Transition, 5 January 2006
- Department of the Army Memorandum: Sustainable Design and Development Policy Update – Life Cycle Costs, 27 April 2007
- Army Strategy for the Environment – Sustainable Army

2.1.1 DoD Minimum Antiterrorism Standards

The intent of UFC 4-010-01, DoD Minimum ATFP is to minimize the possibility of mass casualties in buildings or portions of buildings owned, leased, privatized, or otherwise occupied, managed, or controlled by or for the DoD. These standards provide appropriate, implementable, and enforceable measures to establish a level of protection against terrorist attacks for all inhabited DoD buildings where no known threat of terrorist activity currently exists. While complete protection against all potential threats for every inhabited building is cost prohibitive, the intent of these standards can be achieved through prudent master planning, real estate acquisition, and design and construction practices.

There are several major design strategies that are applied throughout these standards. They do not account for all measures considered in these standards, but they are the most effective and economical in

protecting DoD personnel from terrorist attacks. These strategies include (brief descriptions are included in appendix A):

- Maximize Standoff Distance
- Prevent Building Collapse
- Minimize Hazardous Flying Debris
- Provide Effective Building Layout
- Limit Airborne Contamination
- Provide Mass Notification
- Facilitate Future Upgrades

Building 5 is defined as a primary gathering building; therefore, ATFP considerations were included in the case study.

2.1.2 Americans with Disabilities Act / Architectural Barriers Act

The Americans with Disabilities Act of 1990, as amended (ADA), a major civil rights law prohibiting discrimination on the basis of disability, establishes design requirements for the construction or alteration of facilities. It covers facilities in the private sector (places of public accommodation and commercial facilities) and the public sector (state and local government facilities). The ADA addresses accessibility guidelines covering newly built and altered facilities. The Architectural Barriers Act of 1968, as amended (ABA), requires access to facilities designed, built, altered, or leased with federal funds.

2.1.3 Section 106 of the National Historic Preservation Act and Adverse Effects

Section 106 of the NHPA requires the federal government to take into account the effects of its actions or programs, specifically on historic properties, prior to implementation. This requirement applies to all proposed actions on federal lands and any proposed activities that are federally supported. The Section 106 process is designed to identify possible conflicts between historic preservation objectives and the proposed activity, and to provide conflict resolution in the public interest through consultation with the SHPO, the Advisory Council on Historic Preservation (ACHP), and/or American Indian tribes. Neither NHPA nor ACHP regulations require that all historic properties must be preserved. They only require the public agency to consider the effects of the proposed undertaking prior to implementation.

Important steps in the Section 106 process are to decide if the undertaking is reviewable (has the potential to affect a historic property) and to identify or determine the effect that the proposed undertaking may have to a historic property. Adverse effects occur when an undertaking may directly or indirectly alter characteristics of a historic property that qualify it for inclusion in the National Register of Historic Places (NRHP). When adverse effects are found, the agency must attempt to mitigate them through consultation.

Examples of adverse effects include:

- Physical destruction of or damage to all or part of the historic property.
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, and hazardous material remediation.

- Provision of handicapped access that is not consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (36 *Code of Federal Regulations* [CFR] part 68) and applicable guidelines.
- Removal of the property from its historic location.
- Change to the character of the property's use, or physical features within the property's setting that contribute to its historic significance.
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.
- Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to a federally recognized American Indian tribe or Native Hawaiian organization.
- Transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

Additional information regarding the *Secretary of the Interior's Standards for the Treatment of Historic Properties* is provided in appendix A.

2.2 LEED RATING SYSTEM OVERVIEW

The building design, construction, and operations industry has enormous environmental impact. The environmental impact of the building design, construction, and operations industry is enormous. Buildings annually consume more than 30% of the total energy consumption and more than 60% of the electricity used in the Unites States (USGBC 2009). In 2006, the commercial building sector produced more than 1 billon metric tons of carbon dioxide.

The LEED Green Building Rating System™ was developed in the early 1990s by the USGBC. LEED encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria.

The LEED system has matured over time resulting in the development of different rating systems. Different rating systems evolved for building typologies, sectors, and project scope. The different rating systems include:

- Existing Building: Operation and Maintenance
- Core and Shell
- New Construction
- Schools
- Neighborhood Development
- Retail
- Healthcare
- Homes
- Historic Preservation
- Commercial Interiors

2.2.1 LEED Rating Systems

For this project, LEED for Schools, Neighborhood Development, Retail, Healthcare, Commercial Interior, and Homes would not be appropriate rating systems. Core and Shell was developed to serve the speculative development market, and not appropriate for Building 5. LEED for Existing Building is designed primarily for implementing sustainable operations and maintenance practices. Due to the extensive renovation program, Existing Building was determined not to be the appropriate rating system for Building 5.

LEED for New Construction was designed primarily for new commercial office buildings. LEED for New Construction addresses design and construction activities for both new buildings and major renovations of existing buildings. A major renovation involves major heating, ventilation, and air-conditioning (HVAC) renovation, significant envelope modifications, and major interior rehabilitation. For a major renovation of an existing building such as the plans for Building 5, LEED for New Construction is the appropriate rating system and is, therefore, the focus of this report.

2.2.2 Overview and Process

The LEED 2009 Green Building Rating System for New Construction and Major Renovations is a set of performance standards for certifying the design and construction of commercial or institutional buildings and high-rise residential buildings of all sizes, both public and private. The intent is to promote healthful, durable, affordable, and environmentally sound practices in building design and construction.

Prerequisites and credits in the LEED 2009 for New Construction and Major Renovations address seven topics:

1. Sustainable Sites (SS)
2. Water Efficiency (WE)
3. Energy and Atmosphere (EA)
4. Materials and Resources (MR)
5. Indoor Environmental Quality (IEQ)
6. Innovation in Design (ID)
7. Regional Priority (RP)

LEED 2009 for New Construction and Major Renovations certifications are awarded according to the following scale:

Certified	40–49 points
Silver	50–59 points
Gold	60–79 points
Platinum	80 points and above

To earn LEED certification, the applicant project must satisfy all the prerequisites and qualify for a minimum number of points to attain the established project ratings as set forth below. Having satisfied the basic prerequisites of the program, applicant projects are then rated according to the degree of compliance within the rating system.

2.2.3 Minimum Program Requirements

The LEED 2009 Minimum Program Requirements (MPRs) define the minimum characteristics that a project must possess in order to be eligible for certification under LEED 2009.

1. Must Comply with Environmental Laws.
2. Must be a Building.
3. Must Use a Reasonable Site Boundary. A LEED project boundary must include all relevant site features associated with the building's normal operation.
4. Must Comply with Minimum Full-time Equivalent (FTE) and Floor Area Requirements. A project that serves one or more FTE occupancy calculated as an annual average is eligible to use LEED in its entirety. All projects, regardless of FTE, must earn all LEED prerequisites. The LEED project must include a minimum of 1,000 gross square feet (sq ft) (93 gross square meters) of indoor, enclosed building floor area.
5. Registration and Certification Activity Must Comply with Reasonable Timetables and Rating System Sunset Dates Subsequent to Registration Under LEED 2009. A substantial level of application activity (such as updates to general submittals data, LEED online activity by project team members, communication with CBs, applying for certification, etc.) must occur within four years.
6. Must Allow USGBC Access to Whole-building Energy and Water Usage Data. All certified projects in LEED 2009 must commit to allow USGBC to access all available actual whole-project energy and water usage data in the future for research purposes.
7. Must Comply with a Minimum Building Area to Site Area Ratio. The LEED project building's total gross floor area must be no less than 2% of the LEED project's site area.

2.2.4 LEED 2009 for New Construction Check List

The following table lists the possible credits and points for each LEED topic and credit category that are applicable to DoD construction projects (excludes credits only applicable to schools or core and shell).

TABLE 2-1. LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

Sustainable Sites		
Credit No.	**Credit Category**	**Possible Points**
Prerequisite	Construction Activity – Pollution Prevention	Required
Credit 1*	Site Selection	1
Credit 2*	Development Diversity and Community Connection	5
Credit 3*	Brownfield Development	1
Credit 4.1	Alternative Transportation – Public Transportation	6
Credit 4.2	Alternative Transportation – Bicycle Storage and Changing Room	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

TABLE 2-1. LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

Sustainable Sites		
Credit No.	**Credit Category**	**Possible Points**
Credit 5.2	Site Development – Maximize Open Space	1
Credit 6.1	Stormwater – Quantity Control	1
Credit 6.2	Stormwater – Quality Control	1
Credit 7.1	Heat Island – Nonroof	1
Credit 7.2	Heat Island – Roof	1
Credit 8	Light Pollution Reduction	1
	Total	**26**

*Credits 1, 2, and 3 may not be applicable to renovations of historic buildings because the building is already sited and built.

TABLE 2-1. (CONT.) LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

Water Efficiency		
Credit No.	**Credit Category**	**Possible Points**
Prerequisite	Water Use Reduction	Required
Credit 1	Water Efficient Landscaping	4
Credit 2	Innovative Wastewater Technologies	2
Credit 3	Water Use Reduction	4
	Total	**10**

TABLE 2-1. (CONT.) LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

Energy and Atmosphere		
Credit No.	**Credit Category**	**Possible Points**
Prerequisite	Fundamental Commissioning of Building Energy Systems	Required
Prerequisite	Minimum Energy Performance	Required
Prerequisite	Fundamental Refrigerant Management	Required
Credit 1	Optimizing Energy Performance	19
Credit 2	On-site Renewable Energy	7
Credit 3	Enhanced Commissioning	2
Credit 4	Enhanced Refrigeration Management	2
Credit 5	Measurement and Verification	3
Credit 6	Green Power	2
	Total	**35**

TABLE 2-1. (CONT.) LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

Materials and Resources		
Credit No.	**Credit Category**	**Possible Points**
Prerequisite	Storage and Collection of Recyclables	Required
Credit 1.1	Building Reuse – Maintain Existing Walls, Floors, and Roof	3
Credit 1.2	Building Reuse – Maintain Existing Interior Nonstructural Elements	1
Credit 2	Construction Waste Management	2
Credit 3	Material Reuse	2
Credit 4	Recycled Content	2
Credit 5	Regional Materials	2
Credit 6	Rapidly Renewable Materials	1
Credit 7	Certifiable Wood	1
	Total	**14**

TABLE 2-1. (CONT.) LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

Indoor Environmental Quality		
Credit No.	**Credit Category**	**Possible Points**
Prerequisite	Minimum Indoor Air Quality Performance	Required
Prerequisite	Environmental Tobacco Smoke Control	Required
Credit 1	Outdoor Air Delivery Monitoring	1
Credit 2	Increased Ventilation	1
Credit 3.1	Construction Indoor Air Quality Management Plan—During Construction	1
Credit 3.2	Construction Indoor Air Quality 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
	Total	**15**

TABLE 2-1. (CONT.) LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

Innovation in Design, Six Possible Points		
Credit No.	**Credit Category**	**Points**
Credit 1	Innovations in Design could include sustainable strategies resulting in building performance that greatly exceed what is required or sustainable strategies not address by other LEED credits	
Credit 1		
Credit 1		
Credit 1		
Credit 1		
Credit 2	LEED Accredited Professional	1
	Total	**6**

TABLE 2-1. (CONT.) LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

Regional Priority		
Credit No.	**Credit Category**	**Points**
Credit 1	Address environmental issues unique to a region and are based on physical location of project	
Credit 2		
Credit 3		
Credit 4		
	Total	**4**

Credit Area		**Possible Points**
SS	Sustainable Sites	26
WE	Water Efficiency	10
EA	Energy and Atmosphere	35
MR	Material and Resources	14
IEQ	Indoor Environmental Quality	15
ID	Innovation in Design	6
RP	Regional Priority	4
	Totals	**110**

3.0 CONSIDERATIONS FOR DOD HISTORIC BUILDING RENOVATIONS

Integrating sustainable design into DoD construction projects has been the subject of federal mandates for several years. The federal government must achieve greater goals of energy efficiency improvements in both existing and new facilities. Federal agencies are directed to advance national energy security and environmental performance through achieving several goals including reducing energy intensity, petroleum consumption in fleet vehicles, greenhouse gas emissions (GHG), water consumption, and the use of hazardous chemicals and toxic materials. Building renovations must be conducted in accordance with sustainability strategies, including resource conservation, reduction, and use; siting; and indoor environmental quality.

During January 2006, the Department of the Army released a Sustainable Design and Development Policy Update memorandum that formally stated all new construction would transition from the Army's Sustainable Project Rating Tool (SPiRiT) system to LEED. In addition, all new building construction would be certifiable to the LEED-NC Silver rating. The DoD is transitioning to sustainable design and development to minimize the impacts and ownership costs of military systems, material, facilities, and operations.

The DoD has a large inventory of military buildings listed or eligible for listing in the NRHP. Section 110 of the NHPA requires federal agencies to use their historic properties to the maximum extent feasible for heritage reasons, and a significant number of resources are already dedicated to this activity. There are compelling economic reasons to investigate the reutilization of historic infrastructure (i.e., building rehabilitation promotes DoD goals for transformation to sustainable installations). By preserving or renovating significant historic property characteristics and features in accordance with the Secretary of the Interior's standards, buildings can be revitalized to their original passive energy conservation features including skylights, operable windows, transoms, etc. These renovations can restore the integrity of a historic building while improving daylighting, indoor air exchange, etc., for better energy management, healthier indoor environments, and reduced life-cycle costs (Lindsey 2003).

3.1 HISTORIC PRESERVATION AND LEED CERTIFICATION

Conflicts are perceived to exist between green building practices and technologies and the Secretary of the Interior's standards. Interviews with SHPOs, architects, property owners, and developers were conducted in preparation of a white paper titled "*Green Building Practices and the Secretary of the Interior's Standards for Historic Preservation*" prepared for the 2008 Pocantico Symposium (http://www.preservationnation.org/issues/sustainability/additional-resources/) to examine the relationship between green building and the Secretary of the Interior's standards. The report states that, "Overall, there is consensus among those interviewed that few actual conflicts exist. Furthermore, interviewees believe that the conflicts that do exist are not insurmountable, and these problems are small in relation to the entire building project. Those interviewed believed that designers and preservationists can overcome most potential conflicts through creative design."

Historic buildings were often were traditionally designed to conserve energy and respond to climatic conditions in a time when air conditioning was not widely available. However, many DoD buildings, particularly those constructed to interface with flight lines, were not so designed because orientation of the runway

(relative to prevailing winds) was the primary consideration. Regardless, many historic buildings have sustainable features that responded passively to the local environment and site conditions, including:

- Site components and vegetation that reduce solar energy gains during the cooling season while providing northerly windbreaks and passive solar heating during the heating season.
- Thick masonry walls that provide insulation to prevent excessive temperature changes.
- User-operable windows, transoms, shutters, blinds, shades, awnings, and vents that provide energy-neutral ways to tailor temperature, lighting, and ventilation to the differing needs of occupants in different building zones.
- Cupolas, monitors, skylights, sunrooms, porches, tall windows, and transoms that admit natural light into interior spaces and reduce the daytime demand for artificial lighting.
- High ceilings that, in conjunction with historically compatible ceiling fans, use convection and thermal stratification to comfortably condition the occupied space while moving seasonally uncomfortable temperatures up and away from the occupants (Lindsey 2003).

These building features, when in serviceable working order, can conserve material and energy resources and fulfill several LEED credits.

While the Secretary of the Interior's standards and sustainability design principles significantly reinforce each other, they may also pose conflicting demands. For example, on-site renewable energy sources such as solar and wind present particularly difficult challenges and cannot be accommodated by the Secretary of the Interior's standards. The standards, however, are not prescriptive; they do not specifically state what changes should be made to resources and what elements must be saved. Instead, they "provide philosophical consistency to the work" once a treatment for the building is chosen. The standards are meant to "promote responsible preservation practices that help protect our nation's irreplaceable cultural resources."

For major renovation projects, the standards for rehabilitation are less restrictive than the preservation standards, and advise projects to retain the building's character, but acknowledge that the historic fabric may need to be altered or added to accommodate new use for the building. The rehabilitation standards and guidelines allow for replacement of damaged features using traditional or substitute materials, and also allows for alterations and additions to buildings.

The standards and guidelines currently address energy efficiency, but do not *encourage* energy efficiency measures. Instead, the standards suggest that energy conservation techniques have potentially negative effects on resources, "[energy efficient practices are] usually not part of the overall process of protecting or repairing character-defining features; rather, such work is assessed for its potential negative impact on the building's historic character. For this reason, particular care must be taken not to radically change, obscure, damage or destroy character-defining materials or features in the process of meeting. . . energy requirements."

Specific areas where sustainable design and the Secretary of the Interior's standards seem to conflict involve the following six building elements. Descriptive information is summarized from "Green Building Practices and the Secretary of the Interior's Standards for Historic Preservation" prepared for the 2008 Pocantico Symposium.

Windows

The majority of those interviewed said that windows represent the single largest challenge related to green building and preservation. Specifically, improving energy efficiency in historic buildings requires the replacement of historic windows. However, historic windows are integral to the character and fabric of historic buildings, and the Secretary of the Interior's standards and guidelines advise that they be retained whenever possible.

Preservationists and architects cite a number of effective ways to increase the efficiency of windows while retaining their fabric and character. These include placing storm windows either on the interior or exterior of the historic window, adding a nano-ceramic film on the window, or replacing the original glass with insulated glass units while maintaining the historic wood sash. Research suggests that rehabilitated traditional windows can perform as effectively as new thermally resistant windows. Importantly, unlike most modern replacement windows, traditional windows can be repaired.

Another issue somewhat related to replacing historic windows with new windows is that owners sometimes want to make larger openings in the walls of the building to allow more natural light. Increasing natural light in a building is advocated by the USGBC because ample daylight reduces the need for energy-intensive artificial lighting and has been shown to improve occupant well-being and performance. Typically the Secretary of the Interior's standards would not allow new openings in exterior walls.

Sometimes windows are deteriorated beyond repair, and in those cases review boards approved efficient replacement windows with the same muntin structure. Also, if windows in historic buildings were not historic themselves, then there is usually not an issue with replacing them with new efficient windows.

Roofs

There are a number of popular and well-known green treatments for roofs including vegetation-covered roofs and highly reflective roofing materials, and because the majority of roofs of historic buildings can be seen from the public right-of-way, roofs are one of the areas of the building where the greatest aesthetic conflict can occur. Increased interest in generating renewable energy on-site through the use of solar panels installed on roofs is also an issue of concern.

Solar Panels

The addition of solar panels to a visible section of a historic roof is one of the potential conflicts between green practices and Secretary of the Interior's standards that may be difficult to overcome. Research for this paper revealed that most projects requesting the addition of visible solar panels were denied. Solar panels on the side of roofs that do not face the street or possibly on the ground adjacent to the building in historic districts tend to be approved.

Green Roofs

Green roofs often present potential conflict. This LEED credit may be difficult to impossible to achieve by adding elements including vegetative roofs requiring the replacement of the original roof structure and material. These changes could damage the historic integrity of the building and would not be supported by the Secretary of the Interior's standards.

Insulation

Owners may want to increase insulation in the walls or roof/ceilings of their buildings because large amounts of heat can escape the building. The Secretary of the Interior's standards advise that insulation must be added only to the interior of the exterior walls, and not on the exterior of the building. Sometimes adding insulation to the interior of these walls presents a challenge since walls may have significant features, e.g., exposed brick or plaster that would be obscured by the addition of insulating materials.

Adding insulation to ceilings sometimes presents similar challenges. Often, building owners desire to increase the R-value of the roofs and ceilings through thermal insulation using bats or insulated drop ceilings. However, if the ceiling structure is significant to the character of the building, the Secretary's standards would not allow the owners to add more insulation to the ceiling.

Sites

Setting, landscaping, courtyards, approaches, and grounds can be an integral part to the NRHP-listed property, and it may be important to maintain these elements. Thus, replacing landscaping, for example, with native more drought-tolerant species may not be permissible.

Decreasing light pollution may also be problematic if there are a number of significant historic lighting features on the exterior of the building. However, using energy efficient light bulbs in the historic fixtures, and using a timer to automatically turn off the lights at night will decrease energy usage and light pollution.

As stated in section 4.5.1, Building 5 provided many advantages to achieving LEED and historic preservation goals due to overall design/style and the modifications installed. Another project currently in progress (the renovation of the Illinois Army National Guard's Urbana Armory) has similar advantages—the Urbana Armory also did not have original windows, and the roof did not need to be replaced, only insulated. The primary historic preservation concern for this project was maintaining the openness of the four-story drill floor, yet creating more useable space within the building.

3.1.1 Nondestructive "Green" Strategies for Historic Buildings

There are other operations and management techniques that do not require removal of historic features and are therefore not addressed in the Secretary of the Interior's standards. Many small changes can result in positive results in reducing water and energy use. There are new products on the market now and being continually introduced including photovoltaic and alternative power sources. Historic or replicated historic lighting fixtures can be fitted with the use of compact fluorescence. Flooring products from recycled materials can resemble original flooring. Using environmentally formulated cleaning products, keeping buildings in good operating condition, and having a waste recycling program improves sustainability ratings of buildings. Other techniques include:

- using public transportation and carpools
- providing changing rooms for bicycle riders/joggers
- using electrically powered vehicles
- programming utilities to reflect office-hour comfort
- using green building cleaning products
- using native plant species that require less care

- retaining historic materials and features
- recycling demolition waste of nonhistoric materials
- integrating new high-content recycled materials
- improving energy efficiency of exterior envelope/windows
- reducing water flow in bathrooms
- using motion detectors to control lighting levels
- changing light fixtures to compact fluorescents
- using high efficiency HVAC systems with fan settings
- using "gray" water or rainwater for irrigation

3.2 PRESERVATION AND CONSERVATION

One of the primary goals in sustainable design is resource conservation. Sustainable design practices target reducing both construction waste and building occupant waste. Credits are also given to reusing existing materials and using new materials with high recycled content. The reuse of an existing building maximizes resource conservation. By avoiding any demolition associated with new construction, the renovation project reduces materials destined for a landfill and reuses substantial portions of the existing building.

Historic buildings, therefore, are inherently sustainable because their preservation maximizes the use of existing materials and infrastructure, reduces waste, and preserves the historic character of older installations. In addition to reducing construction waste and demolition waste that would otherwise go to a landfill, reusing existing buildings eliminates consumption of undeveloped land that may remain green space, provide local wildlife habitat, and help reduce urban sprawl.

The United States, with 5% of the world's population, is responsible for 22% of the world's greenhouse gas emissions. Approximately 43% of U.S. carbon emissions are generated by the operation of buildings. This percentage does not include the carbon that is generated by extracting, manufacturing, and transporting building materials. Buildings are vast repositories of energy. It takes energy to manufacture or extract building materials, more energy to transport them to a construction site, and still more energy to assemble them into a building. All of that energy is embodied in the finished structure and if the structure is demolished and land-filled, the energy reservoir is wasted. Additionally, the process of demolition uses more energy as does construction of a new building in place of the demolished structure. Therefore, retention and reuse of older buildings is an effective tool for sustainable stewardship through the conservation of energy and resources that have already been expended (Moe 2008).

To illustrate the concept of "embodied energy," Boston City Hall has about 500,000 sq ft of space. The amount of energy embodied in that building is about 800 billion BTUs—the equivalent of about 6.5 million gallons of oil. If the building were to be demolished, all embodied energy would be lost. In addition, demolishing Boston City Hall would create about 40,000 tons of debris, enough to fill more than 250 railroad boxcars (a train nearly 2.5 miles long) to be placed in a landfill. (The Environmental Protection Agency has noted that building construction debris constitutes about a third of all waste generated in this country, and has projected that over 27% of existing buildings will be replaced between 2000 and 2030 [Rypkema 2007].) Constructing a new 500,000 sq ft replacement building on the site of Boston City Hall would release about as much carbon into the atmosphere as driving a car 30 million miles or 1,200 times around the world. A recent study from the United Kingdom found that it takes 35 to

50 years for an energy-efficient new home to recover the carbon expended in constructing it (Moe 2008). Also, historic buildings are, in general, constructed of brick, plaster, concrete, and timber, which are among the least energy consumptive of building materials. Major components of new buildings are plastic, steel, vinyl, and aluminum, which are among the most energy consumptive of materials (Rypkema 2007). Therefore, preservation saves energy by "taking advantage of the nonrecoverable energy embodied in an existing building and extending the use of it" (ACHP 1979).

The broadened concept of sustainable development includes environmental responsibility, economic responsibility, and social responsibility. Stewardship of our historic built environment benefits the public both from preserving our historic heritage and protecting natural resources. A well-rehabilitated historic building can also become a centerpiece for the installation.

As stated first by Carl Elefante, "the greenest building is the one already built." Historic buildings are a renewable, not disposable, resource. Therefore, appropriate rehabilitation and reuse of existing (historic) buildings, rather than new construction, is the single most important way for an installation to improve its sustainability rating while meeting current and developing mission requirements (Lindsey et al. 2003). The rehabilitation of historic buildings can aid DoD in achieving sustainability and energy efficiency mandates and complying with NHPA Section 110.

3.3 INVESTMENTS AND LEED COST CONSIDERATIONS

Reuse promotes sustainability by reducing virgin materials consumption and processing energy, waste production, and ecological degradation. Building reuse capitalizes on past investment in materials and construction-related energy to reduce current and future construction costs and realize new value from historic buildings. Renovating an existing building can result in fewer site preparation and infrastructure costs compared to constructing a new building at a remote edge of the cantonment. Managing construction waste and implementing aggressive building recycling programs reduces fees paid to landfills and postpones the cost of constructing a new landfill when existing sites are at capacity. Using natural lighting and control systems can reduce the size and cost of mechanical systems. Green buildings are also designed for overall life-cycle costs, which translates to greater durability and fewer repairs. Many sustainable design credits also target reducing the cost associated with cleaning and maintenance (Lindsey et al. 2003).

The DoD owns over 340,000 buildings in the United States and its territories, of which approximately 140,000 will reach the age of 50 by 2015 (Sullivan 2006). Since all buildings 50 years of age or older are subject to NHPA requirements, effectively 67% of DoD buildings could be considered historic (i.e., eligible or potentially eligible for listing in the NRHP) by 2015. Even with adjustments for new construction, demolition, and other disposal activities, over half of DoD real property inventory consists of older, existing buildings. As a result, it makes economic sense to develop solutions to renovate existing and historic buildings for effective long-term use (Lindsey et al. 2003).

To replace the historic building with an even more sustainable and energy efficient building meeting LEED certification, would result in the complete, irreversible loss of the historic building and would be contrary to historic preservation laws and DoD policies. Constructing a new office building that duplicates the historic craftsmanship and materials would be virtually impossible today without significant cost. Therefore, using existing historic building stock and their components (e.g., high ceilings, architectural ornament, abundant windows, and rich finishes) is typically less expensive than constructing a new building of similar materials and features.

The USGBC fees for project registration and certification reviews range from $2,250 (for buildings under 50,000 sq ft) to $22,500 (maximum). This is only a fraction of the LEED process costs. Energy modeling and commissioning, two prerequisites, usually add another $20,000 to $70,000 each. LEED project management, whether performed by a sustainability consultant or the architect, tends to add an extra $20,000 to $70,000. LEED online documentation requirements increased fees for the architect, civil engineer, landscape architect, other consultants, and construction contractors. Since these basic costs vary little with project size, they can be prohibitive for smaller project budgets. Certain credits require monitoring and verification (and possible systems adjustments) for a year after occupancy of the building; this cost is generally not included in the construction budget.

Another issue that may make LEED impractical is if any of the prerequisites cannot be met; then LEED certification is automatically not pursued. Another flaw with the system is the temptation to buy points by pursuing easier strategies, regardless of whether they fit the project's goals or make it more sustainable to reach the required LEED level. The intent of sustainability involves lifestyle choices such as carpooling, walking, and using less water and energy; ongoing education to influence building occupants' behavior may also involve unforeseen costs.

3.4 OTHER DOD LEGACY PROGRAM PROJECTS

The DoD Legacy Program has two other projects currently funded (fiscal year [FY] 2009) and in development that will provide additional information for "greening" historic buildings. One project, titled "Historic Building Efficiencies Guidance," is a study to conduct a comparative analysis of DoD and non-DoD historic properties that have been rehabilitated to "sustainable design" standards. The final report will present case studies and recommendations. The second project, entitled "Maintaining Elements that are Efficient by Design (Or What's Already 'Green' About Our Historic Buildings?"), proposes to use representative DoD building types to identify aspects of their construction that are "green" or energy efficient. These reports should be available in the coming year.

The DoD Legacy Program and the U.S. Army Corps of Engineers, Engineer Research and Development Center, also sponsored a project resulting in the development of a report titled "DoD Sustainability Application Guide for Historic Properties," completed in May 2007. This report provides sustainable design principals and strategies for historic buildings using the LEED-EB version 2.0. Although LEED-EB version 2.0 has been superseded by LEED-EB version 3.0, Operations and Maintenance, this document provides valid strategies for achieving LEED credits.

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4.0 BUILDING 5 – A CASE STUDY

The objectives of the case study of Building 5 (figure 4-1) were to determine the feasibility of achieving sustainability and historic preservation goals and, if feasible, determine the additional costs, if any, to do so. The case study was conducted in five major steps. The first two steps were to prepare and conduct the charrette. These steps and results are presented in this chapter. The design charrette resulted in an overall LEED strategy for Building 5 (section 4.3). Following the charrette, a cost analysis was conducted (section 4.4) and a feasibility analysis was completed (section 4.5).

FIGURE 4-1. VIEW OF BUILDING 5, WEST ELEVATION

4.1 PRE-CHARRETTE MEETING, DATA COLLECTION, AND CHARRETTE PREPARATION

The project lead met with the INARNG and other industry experts to collect data for the charrette, including:

Indiana Army National Guard

- United States Property and Fiscal Office (USPFO) and state equivalent: to understand the building program for renovation of Building 5.

- INARNG CRM: to discuss the project, determine and arrange for the charrette meeting location and dates.
- INARNG Master Planner Contractor: to discuss overall plans for Stout Field and the INARNG.
- INARNG Facility Manager for Building 5: to conduct reconnaissance and gather information about Building 5.

The project lead and the INARNG CRM met with the Indiana Department of Historic Preservation and Archaeology (DHPA) to discuss the character-defining features of Building 5 and the project role of the DHPA.

The project lead also met with a representative of the Indiana chapter of the USGBC to discuss their role in the project.

After a site visit, the project team prepared background and informational materials for the charrette and coordinated the workshop. Background information on the building program and Building 5 are included in sections 4.4 and 4.5 of this report, and additional charrette handout materials are included in appendix C.

4.2 LEED STRATEGY AND CONCEPTS CHARRETTE

The benefits of using charrettes early in the design process are many. Most importantly, charrettes can save time and money while improving project performance. Charrettes provide a forum for those who can influence design decisions on a project to meet and begin planning for the project. Charrettes also:

- Save time and money by soliciting ideas, issues, and concerns for the project design to help avoid later interactive redesign activities.
- Establish a multidisciplinary team that can set and agree on common project goals.
- Develop early consensus on project design priorities.
- Provide early understanding of the potential impact of various design strategies.
- Initiate an integrated design process to reduce project costs and schedules, and obtain the best energy and environmental performance.

The charrette was held over a two-day period on 19–20 May 2009, at the Minnesota Street Readiness Center (north of Stout Field) in Indianapolis, Indiana. The intent of the charrette was to:

- Discuss construction program goals.
- Discuss LEED certification and point system.
- Define the historically significant, character-defining features and what would be necessary to have a "no adverse effect" determination under Section 106 of the NHPA.
- Present the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.
- Develop a LEED credit-by-credit strategy for achieving LEED Silver certification and preserving the historical integrity of the building.

The following people participated in the charrette:

Name	Organization
Jayne Aaron	Sticks & Stones Environmental Consultants, LLC / DoD Legacy Program Project Author / Charrette Facilitator
Sarah Schill	Innovar Environmental, Inc. – Charrette Support
Mark Swaim	INARNG – Plant (Facility) Manager
James Smith	RQAW Corp. – Renovation / Architectural Design Team
Roger Bricker	INARNG – Energy Manager
Jim O'Brien	INARNG – Project Manager / Facilities Engineering
Kari Carmany-George	INARNG – Cultural Resources Manager / DoD Legacy Program Project Sponsor
Sanjay Patel	RQAW Corp. – Renovation / Architectural Design Team
Charissa Durst	Hardlines Design / Provide Expertise to Historic Buildings and LEED Strategies
Chad Slider	Indiana Division of Historic Preservation and Archaeology / SHPO
David Duvall	Indiana Division of Historic Preservation and Archaeology / SHPO
Mac Williams	Indiana Chapter of USGBC Representative / Architect
Melissa Tupper	RTM Consultants, Inc. – Provided Building Codes Expertise
Nathan Eaton	INARNG – Planning Office / GIS
Bob Atnip	INARNG – Master Planner
Bob Taylor	INARNG – Antiterrorism Force Protection Expert

The agenda and handouts for the charrette are included or identified in appendix C of this report. In general, the first half of day one was devoted to presentation and discussion of Building 5 and project parameters. The second half of day one of the charrette included a tour of Building 5, an overview of the LEED Green Building Rating System and LEED certification strategy developed by the contractor to date. The following four subsections provide a brief summary of the first day's discussions.

4.2.1 INARNG Building Renovation Goals and Program Considerations

At the time of the charrette, the plans for Building 5 were to complete a major interior renovation to provide offices for J1 Administration, Recruitment, and Retention. Building 5 has 28,080 sq ft of interior space. The following components were identified for the renovation and presented at the charrette:

- offices and cubicle work spaces for approximately 250 people (retain flexibility for future staff reorganization or use)
- records and general office storage
- restrooms
- conference rooms
- small museum
- mechanical, electrical, plumbing, and communication systems (will need to be replaced)

- windows are all replacements within the last 10 years and will not be replaced unless necessary for ATFP or solar purposes
- replace roof
- no plans for the control tower (possibly control for mechanical system)
- meet ADA requirements and fire and life safety codes
- remove fireplace in the hangar shop space

For the charrette and LEED certification, the project boundary was defined as:

- fenceline to east
- road to west
- half-way between Building 5 and Building 4 to north
- farthest edge of parking lot to south (excluding access road to south because could construct on space south of parking lot)

This resulted in a project area of 2.0 acres, including a building footprint of 14,040 sq ft / 0.32 acre, hardscape (parking lot, access road, etc.) of 33,975 sq ft / 0.78 acre, and green space (lawn) of 39,310 sq ft / 0.9 acre.

Vehicle parking includes spaces in front of the main entrance, south parking lot, and a large parking lot across the street to the west. The south parking lot is also used for weekend training—the west lot serves other buildings. INARNG staff at Stout Field participates in a local organization (CSIC) carpool program, although it is not widely used at the present time. It was discussed that government vehicles could be E85/ flex fuel and that INARNG can designate parking for carpool and flex-fuel vehicles as a sustainable strategy for LEED.

Stormwater management is an issue for the City of Indianapolis due to age and capacity of infrastructure. A stormwater fee is levied and taxed based on amount of impervious surface (pavement and roof).

Two large steam boilers are in the basement boiler room. One is offline and original, the other was installed in 1993. The boilers originally serviced 12 buildings, but now service only 5.

Buildings are not individually metered. INARNG wants to replace the boiler with individual systems in each building and eliminate the central steam system. INARNG would like to replace the steam system with a hot water boiler loop in Building 5. INARNG believes this would result in savings of $50,000 to $100,000 per year in energy costs.

INARNG would consider a geothermal or thermal loop system, and would also consider a solar energy system as a back-up (emergency) power system.

4.2.2 DoD Minimum Antiterrorism Standards

Under ATFP, Building 5 is defined as a primary gathering building—an inhabited building routinely occupied by 50 or more DoD personnel. This designation applies to the entire portion of a building that meets the population density requirements for an inhabited building. For example, if a portion of an inhabited building has 50 or more people in it, the entire inhabited portion of the building will be considered a primary gathering building. Inhabited buildings whose populations are increased through

inhabited building additions (such that the combined building meets the definition of a primary gathering building) will be considered to be primary gathering buildings for their entire inhabited portions. Building 5 is within 15 feet of the Stout Field boundary. The ATFP requires that for the proposed use of the building, there needs to be 82 feet between the building and fence line. Since the ATFP requirement would need to be addressed in this renovation project, it was discussed during the charrette because it has implications for both historic preservation and achieving LEED certification.

According to INARNG ATFP Specialist Robert Taylor, the standoff distances (a distance maintained between a building or a portion thereof and the potential location for an explosive detonation, which in this case would be the fence line) are of most concern regarding Building 5. He indicated that there are four possible options to achieve the required standoff distance, or building hardening, to withstand an explosion:

1. Move Holt Road and install blast-resistant windows and ensure that Building 5 has 8-inch concrete walls.
2. Build a blast wall along the east elevation 10 to 15 feet high (windows would require reinforcement).
3. Obtain an exemption from the National Guard Bureau stating that the adjutant general accepts the risk, although blast-resistant windows may still be required.
4. Reinforce the existing walls of Building 5 to withstand a 250-pound car bomb and remove the windows along the east elevation on both the first and second floors.

Other considerations for Building 5 and ATFP include:

- Parking within 82 feet of the building.
- No screening or obstructions within 33 feet of the building allowed.
- Exterior door must open inward.
- Controlled access to the roof.
- Outside air intakes throughout the building should be 10 feet aboveground.
- HVAC control systems must have an emergency shut-off switch.
- High efficiency particulate air (HEPA) filters should be applied to all air intakes.
- Building should be slightly over pressurized.
- Must have controlled access to potable water and distribution system.

4.2.3 Americans with Disabilities Act / Architectural Barriers Act

Melissa Tupper, RTM Consultants, provided clarification on applicable building codes. She spoke to the ADA codes relevant to Building 5. Usage of Building 5 (office space) will remain unchanged—the state does not require that the entire building be brought up to meet current code. Only new sections must comply (i.e., a door, or changing a room by removing a wall). Painting and lighting changes do not trigger the code. The occupant load per square foot for assembly space is 7.0 sq ft per person (A Class) versus 100.0 sq ft for office space (B Class). Much of Building 5 would be B Class. If the third floor was elevator-accessible and no sprinklers were installed, an “area of refuge” for disabled persons awaiting rescue would be required. Adding an elevator introduces accessibility to the upper floors, meaning that the bathrooms, etc., must be accessible. The hangar space is grandfathered in and does not require a sprinkler, even if used as assembly space. However, ADA codes may need to be addressed in other

renovation projects if a building's use is changed, which was discussed during the charrette because of implications for both historic preservation and achieving LEED certification.

4.2.4 Section 106 of the National Historic Preservation Act and Adverse Effects

The ACHP established and codified step-by-step procedures for complying with Section 106 of the NHPA in 36 CFR Part 800. In 36 CFR Part 800.5, Protection of Historic Properties (incorporating amendments effective 5 August 2004) examples of adverse effect include:

> *. . .physical destruction of or damage; alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the* Secretary of the Interior's Standards for the Treatment of Historic Properties *(36 CFR, part 68) and applicable guidelines; and change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance to all or part of the property.*

As stated above, the intent of the standards is to assist long-term preservation of a property's significance through the preservation of historic materials, features, and character. Therefore, in order to achieve the project goal of having "no adverse effect" under Section 106 of the NHPA, character-defining features must be preserved. A brief history of Stout Field and Building 5 is included in appendix B.

A Maintenance and Treatment Plan was developed for Building 5 in 2009 to address ongoing maintenance activities while preserving the historic fabric of the building (Gary & Pape 2009). During the development of this plan, character-defining features were identified in relationship to maintenance activities. A few additional features that were not appropriate to identify in a maintenance and treatment plan due to their nature (such as shapes, spaces, and views) were identified during the charrette. The character-defining features for Building 5 include:

- Overall Shape of Building. A central core and control tower with symmetrical wings with horizontal massing and minimal horizontal elements (windows, railings, etc.).

- Exterior. Original floodlight on parapet, exterior concrete walls, original metal clad exterior doors, unobstructed view of front façade from pedestrian or vehicular access.

- Control Tower. Gutter trough and downspouts on the roof, ladder, and catwalk between the control tower and roof; concrete spanning slabs and wood-frame flooring system; original steel sash windows; metal cladding; wood paneling on interior walls and ceiling.

- Bathrooms. Original hexagonal porcelain floor tile, glazed terracotta tile on walls, and floor-mounted plumbing fixtures where they currently exist (not all bathrooms still contain these features).

- First Floor. Nonstructural frame and cinderblock walls, original metal clad interior doors, original interior wood doors, steel pan stair from first to second floor, concrete in vehicle and hangar bays, and hangar bay space.

FIGURE 4-2. FRONT FAÇADE, WEST ELEVATION OF BUILDING 5

FIGURE 4-3. VIEW OF EAST AND NORTH ELEVATIONS OF BUILDING 5

- Second Floor. Hangar bay space, nonstructural frame and cinderblock walls, original steel sash windows, original metal clad interior doors, original interior wood doors, steel pan stair from second to third floor, glazed tile walls in shower stalls representing historic fabric (materials and construction methods, not a character-defining feature, should be retained and appropriately repaired), and original resilient tile flooring in dormitory corridor (may contain asbestos).

4.3 LEED STRATEGY FOR BUILDING 5

Prior to the charrette, the contractor project team determined whether the necessary prerequisites for LEED certification could be achieved and which points were easily achievable. These data are summarized in table 4-1. During the presentation and discussion of these strategies, some of the credits were called into question and are documented in the notes column of table 4-1.

TABLE 4-1. LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Sustainable Sites				
Credit No.	**Credit Category**	**Possible Points**	**Points Achieved**	**Notes**
Prerequisite	Construction Activity – Pollution Prevention	Required	X	
Credit 1	Site Selection	1	1	
Credit 2	Development Diversity and Community Connection	5	0	
Credit 3	Brownfield Development	1	0	
Credit 4.1	Alternative Transportation – Public Transportation	6	0	Check on this, may be sufficient bus stops in area. Further research indicated that this credit is not possible.
Credit 4.2	Alternative Transportation – Bicycle Storage and Changing Room	1	1	
Credit 4.3	Alternative Transportation – Low-emitting and Fuel Efficient Vehicles	3	3	
Credit 4.4	Alternative Transportation – Parking Capacity	2	2	
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 – Quantity Control	1		
Credit 6.2	Stormwater – Quality Control	1		
Credit 7.1	Heat Island – Nonroof	1		
Credit 7.2	Heat Island – Roof	1		
Credit 8	Light Pollution Reduction	1		
	Total	**26**	**9**	

TABLE 4-1. (CONT.) LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Water Efficiency				
Credit No.	**Credit Category**	**Possible Points**	**Points Achieved**	**Notes**
Prerequisite	Water Use Reduction	Required	X	
Credit 1	Water Efficient Landscaping	2–4	4	
Credit 2	Innovative Wastewater Technologies	2		
Credit 3	Water Use Reduction	2–4		
	Total	**6-10**	**4**	

TABLE 4-1. (CONT.) LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Energy and Atmosphere				
Credit No.	**Credit Category**	**Possible Points**	**Points Achieved**	**Notes**
Prerequisite	Fundamental Commissioning of Building Energy Systems	Required	X	
Prerequisite	Minimum Energy Performance	Required	X	
Prerequisite	Fundamental Refrigerant Management	Required	X	
Credit 1	Optimizing Energy Performance	1–19	5	
Credit 2	On-site Renewable Energy	1–7		
Credit 3	Enhanced Commissioning	2		
Credit 4	Enhanced Refrigeration Management	2		
Credit 5	Measurement and Verification	3		
Credit 6	Green Power	2	2	
	Total	**11–35**	**7**	

TABLE 4-1. (CONT.) LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Materials and Resources				
Credit No.	**Credit Category**	**Possible Points**	**Points Achieved**	**Notes**
Prerequisite	Storage and Collection of Recyclables	Required	X	
Credit 1.1	Building Reuse – Maintain Existing Walls, Floors, and Roof	1–3	3	

TABLE 4-1. (CONT.) LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Materials and Resources				
Credit No.	**Credit Category**	**Possible Points**	**Points Achieved**	**Notes**
Credit 1.2	Building Reuse – Maintain Existing Interior Nonstructural Elements	1	0	Check on this, need more data on how calculated to make determination. During further discussions, it was decided future plans would likely not include this credit.
Credit 2	Construction Waste Management	1–2	1	
Credit 3	Material Reuse	1–2	1	
Credit 4	Recycled Content	1–2	1	
Credit 5	Regional Materials	1–2	1	
Credit 6	Rapidly Renewable Materials	1	0	Group did not feel that enough of this type of material would be used in this project to justify pursuing this credit.
Credit 7	Certifiable Wood	1	0	Group did not feel that enough wood would be used in this project to justify pursuing this credit.
	Total	**8–14**	**7**	

TABLE 4-1. (CONT.) LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Indoor Environmental Quality				
Credit No.	**Credit Category**	**Possible Points**	**Points Achieved**	**Notes**
Prerequisite	Minimum Indoor Air Quality Performance	Required	X	
Prerequisite	Environmental Tobacco Smoke Control	Required	X	
Credit 1	Outdoor Air Delivery Monitoring	1	1	
Credit 2	Increased Ventilation	1		
Credit 3.1	Construction Indoor Air Quality Management Plan—During Construction	1	1	
Credit 3.2	Construction Indoor Air Quality 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	

TABLE 4-1. (CONT.) LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Indoor Environmental Quality				
Credit No.	**Credit Category**	**Possible Points**	**Points Achieved**	**Notes**
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		
	Total	**15**	**7**	

TABLE 4-1. (CONT.) LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Innovation in Design, Six Possible Points			
Credit No.	**Credit Category**	**Points**	**Notes**
Credit 1			
Credit 1			
Credit 1			
Credit 1			
Credit 1			
Credit 2	LEED Accredited Professional	1	
	Total	**1**	

TABLE 4-1. (CONT.) LEED 2009 PROJECT CHECKLIST FOR BUILDING 5

Regional Priority			
Credit No.	**Credit Category**	**Points**	**Notes**
Credit 1	Sustainable Site Credit 1 – Site Selection	1	
Credit 2	Water Efficiency Credit 1 – Water Efficient Land-scaping	1	
Credit 3			
Credit 4			
	Total	**2**	

Credit Area		Possible Points	Points Achieved
SS	Sustainable Sites	26	9
WE	Water Efficiency	10	4
EA	Energy and Atmosphere	35	7
MR	Material and Resources	14	7
IEQ	Indoor Environmental Quality	15	7
ID	Innovation in Design	6	1
RP	Regional Priority	4	2
	Totals	**110**	**37**

100 base points; Six Possible Innovation in Design and Four Regional Priority Points

- Certified 40–49 points
- Silver 50–59 points
- Gold 60–79 points
- Platinum 80 points and above

During day two, the participants were divided into two groups to develop the remaining credit strategy to achieve Silver certification. Each group contained a representative from the Indiana SHPO's office, a LEED AP, an engineer from RQAW (the renovation architectural design firm), and INARNG representatives. LEED credit score cards for each group are included in appendix C.

4.3.1 Group 1 LEED Strategy

The strategy developed by Group 1 was comprehensive under energy and occupant comfort. They envisioned a total interior gut of Building 5, including all mechanical and HVAC systems. Gutting the building would allow installation of energy systems that are more energy efficient. Strategies include:

- point-of-use controls
- increased R-value and reduce infiltration of thermal envelope
- added insulation to interior walls and roof
- replacement windows
- two-pipe chilled water system, heat pumps, and heat recovery
- ground source heat exchange system for improved efficiency
- air exchange to improve air quality
- renewable energy – solar PV panels
- enhanced commissioning
- efficient lighting
- green or white roof

Optimize comfort and materials:

- point-of-use controls
- remove drop ceiling for daylighting

- resilient flooring
- low volatile organic compound (VOC) materials
- design for compatible spaces
- CO^2 monitoring
- use of local materials – good availability

The Group 1 overall strategy was to reduce window infiltration and add insulation to achieve the points for energy and atmosphere. The group determined that 63 points total were achievable with this strategy. Since the majority of the windows are not original, replacement does not pose an issue for the historical integrity of the building. This group opted not to replace existing systems in order to "buy" points, so credits such as increasing stormwater management by replacing existing parking lot surfaces to increase infiltration were not considered. The group did not consider providing views as achievable. It was determined that the windows and mechanical systems would be the biggest costs and provide the best return for their strategy.

4.3.2 Group 2 LEED Strategy

Group 2 looked at each credit area and developed strategies under each.

Sustainable Sites (total 13 points):

- Increase pervious surfaces: by replacement of front vehicle access area with pervious surface that would reflect more concrete runway as originally designed. If parking lot to south is removed to install geothermal system, replace with pervious surface.
- Heat island: nonroof through increased pervious surface, and roof through light/white color.

Water Efficiency (total 6–8 points):

- Current culture within INARNG is against waterless urinals due to status of maintenance contracts; however, this could change.
- Focus on water-use reduction.

Energy and Atmosphere (total 19–22 points):

- Install new windows to reduce infiltration.
- Use solar and/or geothermal energy sources.
- Enhanced commission,
- Monitoring and verification.
- Refrigerant use to be reduced or excluded.

Materials and Resources (total 9 points):

- Use construction waste management.
- Use of recycled content increased.
- Use of rapidly renewable or certified wood is not practical.

Group 2 did not have time to go through IEQ, but did feel a couple of additional Regional credits and one or two Innovation credits would be achievable, for a total of approximately 61–65 points.

4.3.3 General Discussion

Both groups state that there should be an Innovative credit for integrating historic preservation with sustainability including ideas such as:

- Incorporating LED lighting into historically designed fixtures (lighting design).
- Replacing impervious surfaces with pervious surfaces that reflect historical landscape/airfield features.
- Restoring flooring with recycled-content flooring that looks historic.
- Retaining decorative historic tile.
- Replacing replacement windows to meet ATFP standards that have a more historic style.

The SHPO representative cautioned that replacement of historic features can be complex because it would be moving toward restoration and away from renovation under the Secretary of the Interior's treatment standards.

At the conclusion of the charrette, the facilitator requested input on the value of conducting the workshop. Most stated that it was very helpful. The process helped to clarify the issues associated with the building, possible design solutions, and concerns that the SHPO will have throughout the Section 106 process. It was suggested that, due to the nature of this particular building and its mechanical systems, a good addition to the charrette team would have been a mechanical engineer (figure 4-4).

4.4 BUILDING 5 RENOVATION COST ESTIMATES

4.4.1 Methodology and Assumptions for Cost Analysis

The data used to develop this section of the report were prepared by RQAW. RQAW professionals have been providing engineering and architectural services to private and public sector clients since 1954. RQAW architects and engineers have experience in design and construction for commercial, municipal, and military projects; feasibility planning; roadway and bridge design; historic preservation and adaptive reuse; and recreational planning. The INARNG has considered reuse of Building 5 in the past and RQAW was contracted by INARNG to develop plans for these reuse scenarios. Because of their past work with and knowledge of Building 5, RQAW also participated in the charrette and then developed cost estimates to be used for comparison for design option scenarios for this feasibility study. By having an experienced and project-knowledgeable third party prepare the cost estimates, the assumptions are consistent for each of the scenarios, and potential project bias has been eliminated.

At the time of the DoD Legacy Program project award, INARNG planned to renovate Building 5 primarily for office space to house approximately 250 staff for J1 Administration and Recruitment and Retention. However, due to limited state matching funds, these plans became superfluous, and a new use for Building 5 as a readiness center (armory) has been proposed. The feasibility study was completed using the original J1 Administration and Recruitment and Retention building program parameters, since

FIGURE 4-4. GROUP MEMBERS OF THE CHARRETTE

the charrette and resulting LEED strategy was based on the renovation plans developed for the prior proposed use. Therefore, no actual design has been developed for the DoD Legacy Program project (administrative office) scenarios compared in this section. RQAW architects and engineers developed the cost estimates presented below with professional expertise and judgment, knowledge of the building, and industry standards and models for estimating. These cost estimates were developed in 2009—they are very general due to lack of specific designs, and are intended for scenario comparison only. They are not intended for budgeting purposes.

Three cost estimates were developed for the following Building 5 alternatives, discussed as scenarios:

1. Scenario 1 – demolition and construction of a new building.
2. Scenario 2 – standard renovation of Building 5.
3. Scenario 3 – renovation to meet LEED Strategy and Historic Preservation Goals.

There are several methods to evaluate the economic performance of buildings over a period of time. Life-cycle costing (LCC) represents a current method to evaluate building investment projects. LCC is simply defined as the sum of initial building cost plus recurring and one-time (nonrecurring) costs over the full life span of the building. LCC includes initial construction plus the purchase price, installation cost, operating costs, maintenance, and upgrade costs for HVAC systems, and flooring and roofing materials over the useful life of the building, in this case, 25 years (energy costs are estimated separately and are therefore not included in LCC). Life cycle costs were developed assuming adequate funding would be available, but in reality, maintenance can be deferred due to unpredictable future budgets. For the cost comparison presented below, the total LCC is divided equally by 25 years for an average annual cost. It is acknowledged that this sum is not a reflection of true annual costs, as there should be minimum maintenance upon initial completion of the new construction, and cost increases as the building ages and certain materials meet their design life span.

Energy usage costs were also estimated using industry standard power company models, and current market values for gas and electricity for each of the upgrades that would be made under each scenario.

For scenarios 1 and 2, it is assumed that mitigation for adverse effect would be necessary to comply with Section 106 of the NHPA. Mitigation is the outcome of the consultation process when there is an adverse effect on historic properties. Adverse effects can range in scope from demolition, to a property leaving federal government ownership. Mitigation is used to moderate adverse effects. The minimum mitigation measure would be to provide documentation of the property before it is lost or significantly altered. Typical mitigation measures can include:

- Limiting the magnitude of the undertaking.
- Modifying the undertaking through redesign, reorientation of construction on the project site, or other similar changes.
- Repairing, rehabilitating, or restoring an affected historic property (as opposed, for instance, to demolition).
- Preserving and maintaining operations for involved historic properties.
- Documenting (drawings, photographs, histories) buildings or structures that must be destroyed or substantially altered.
- Relocating historic properties.
- Salvaging archaeological or architectural information and materials.
- Interpreting the property via historical markers, plaques, publications, etc.

Additional mitigation measures may include public participation activities, off-site mitigation for another historic resource, or non site-specific mitigation. For mitigation through documentation, the documentation generally conforms to Historic American Buildings Survey / Historic American Engineering Record / Historic American Landscape Survey (HABS/HAER/HALS) standards and includes drawings, photographs, and histories of the buildings, structures, or resources that would be adversely affected. Since significance levels of the historic property vary, the appropriate level of documentation will vary accordingly.

For the ensuing cost comparison, mitigation of adverse effect is estimated to total $45,000. This sum could represent the completion of a HABS (Level II) document package or another form of mitigation negotiated with the SHPO. This cost is used for comparing the different construction and renovation scenarios only, and should not be assumed to be the outcome of the Section 106 process. Under Scenario 3, it is assumed that renovation would be completed to the *Secretary of the Interior's Standards for the Treatment of Historic Properties* and additional mitigation would not be required.

There would be certain costs to INARNG for any construction project, including staff time for meeting with contractors, contracting requirements, reviewing design and contract documents, consulting with other jurisdictional agencies, and other environmental regulations compliance requirements. These costs would be similar regardless of the scenario and are, therefore, not included.

4.4.2 Demolition and New Building Costs (Scenario 1)

The first scenario includes demolition of Building 5 and construction of a new building. The new building would be of similar size (31,200 sq ft), shape, and constructed primarily of concrete as is the existing building. It is assumed that the building would not have a control tower and that mechanical systems for this building would be sized and operated for this building only. Additional sustainable practices (beyond local building codes) would not be employed in this scenario, so the demolished building materials would go into a landfill and the new design would address the building program without emphasis on energy efficiency or "green" technologies.

	Initial Costs	Total LCC and Energy/Year
Demolition (estimated at 9,426 cubic yards)	$220,000	
New construction	$4,960,800	
Mitigation of adverse effect	$45,000	
Average estimated energy costs		$44,788
Life Cycle Costs		$468,000 (includes initial construction costs)
Total	**$5,225,800**	**$512,788**

4.4.2.1 LEED Certification of a New Building

Cost estimates were not specifically prepared for a newly constructed LEED Silver certified building because of the infinite number of design solutions and variables necessary to determine the cost estimates.

A report compiled by Lisa Fay Matthiessen and Peter Morris of Davis Langdon, a cost-management firm, concluded that building green can have minimal effect—if any—on construction costs if sustainability goals are discussed and integrated early in the design process. In *Costing Green: A Comprehensive Cost Database and Budgeting Methodology,* Matthiessen and Morris state:

> *. . .there is so much variation in building costs that it's basically impossible to determine whether pursuing LEED certification actually increases the cost. Although LEED has done an incredible job of making sustainable design mainstream, it has also contributed to the notion that it is somehow a separate factor. Clients and design teams tend to think that LEED is something you add to the building, and therefore the cost is something you add to the budget. We still haven't gotten used to the idea that LEED is just trying to measure something that we are doing in every aspect of the design.*

This opinion was supported by Northbridge Environmental Management Consultants (Northbridge) in a plan prepared for the American Chemistry Council in 2003—"Analyzing the Cost of Obtaining LEED Certification" (16 April 2003). The authors concluded that:

> *Greening is one area where it is particularly difficult to isolate the true incremental costs of LEED versus other practices and guidelines followed by designers and contractors. Compliance with local codes may lead builders to exactly the same specifications and practices that the LEED guidelines do, so in that case we should not attribute any incremental cost to the LEED process. . . . We lacked adequate data to develop a statistically based value for greening costs. Based on our judgment of the information we reviewed, we believe that an appropriate range for greening costs is three to eight percent of construction costs.*

The LEED process contains "soft costs." The term "soft costs" includes those activities associated with LEED that fall outside the range of construction costs. The soft costs identified include incremental design effort by the architect and design engineers, commissioning the project, documenting compliance with the various LEED credits selected, energy modeling for the project, and LEED application fees. In the American Chemistry Council study, Northbridge estimated these costs to range from 1% to 5% of construction costs, with the smallest projects represented at the higher end of the range.

A significant challenge of the LEED system is the need to document compliance with the various criteria (credits) in order to submit a package to the USGBC for review and a decision on certification. Documentation requires the establishment of a tracking and reporting system (often performed by a LEED consultant, rather than the design and construction team) and researching and providing the information that otherwise is not standard practice in specifying or sourcing systems and materials.

Surveys and articles report that documentation is the greatest challenge that project teams have encountered in working with the LEED process. In one survey, an average of 226 work hours was required to complete the proper LEED documentation necessary for certification. Northbridge cites that in an article by USGBC and the Natural Resources Defense Council (NRDC), documentation was reported at $30,000 to $60,000 for teams working on their first LEED project, although costs could be as low as $10,000 for an experienced team. Northbridge found that architects and contractors were still learning how to provide proper documentation and many of their costs were going unreported and undocumented. Their research also identified documentation costs between $8,000 and $70,000 per project, with the range highly dependent on the experience of the team documenting the LEED process. The size of the building did not appear to influence the amount of money being spent on documentation, so for smaller projects, the costs can be a significant percentage of the total.

The USGBC fee for project registration and certification for a building of comparable size to Building 5 (30,000 sq ft) in 2010 is $2,150. Northbridge derived an estimate of documentation and application fees as a percentage of total construction costs by applying these estimates to a database of currently (at that time) certified LEED projects. Northbridge found that these costs averaged 0.7% of construction costs with a range from 0.05% for a very large project to 3.8% for a very small one.

In a study prepared by Steven Winter Associates, Inc., for the General Services Administration (GSA) in 2004, *LEED Cost Study*, the authors concluded that for the cost of a new large federal building and for a major modernization (renovation) of an office building, LEED costs ranged from 0% to 8%, depending on the level of LEED certification. Although a critic pointed out that the cost of commissioning the building, an expensive prerequisite, was not included in this study because it is already required by GSA (http://libertybuilding.com/archives/246).

Since a 30,000 sq ft building is considered relatively small for a commercial building, it is assumed that LEED costs would be on the higher end of the ranges previously discussed. Therefore, using a percentage of 7.5% for LEED design, construction, and USGBC fees, a newly constructed LEED certified building would cost approximately $5,332,860. Adding demolition of the existing building and mitigation, the total cost would be $5,597,860. Life cycle costs and energy usage would be too variable to calculate without more design parameters, but the worst case would be similar to Scenario 3 for energy usage at $39,046 annually, and Scenario 1 plus increase in construction costs for LCC equaling $501,320. [Note: RQAW did not calculate these estimates, based on above report estimates.]

4.4.3 Standard Renovation Costs (Scenario 2)

Under this scenario, Building 5 would be renovated with standard industry practices. The renovation focus would meet the building program needs to accommodate work and supporting space for 250 people. The focus would not be on preserving the historic fabric of the building or achieving higher energy efficiency. In this scenario, the following parameters and usages would be:

- Office and cubicle work spaces designed for approximately 250 people. The design should be flexible.
- Records and general office storage.
- Renovation of restrooms to upgrade and provide adequate number and floor spacing.
- Conference rooms.
- Small museum.
- The mechanical, electrical, plumbing, and communication systems would be replaced.
- Windows would be replaced to meet necessary ATFP requirements.
- Roof would be replaced with like membrane and sealants.
- Necessary fire safety and ADA requirements would be met.

	Initial Costs	Total LCC and Energy/Year
Renovation	$4,032,000	
Mitigation of adverse effect	$45,000	
Average estimated energy costs		$45,936
Life Cycle Costs		$480,000 (includes initial construction costs)
Total	**$4,077,000**	**$525,936**

4.4.4 Renovation Costs to Meet LEED Strategy and Historic Preservation Goals (Scenario 3)

Under Scenario 3, Building 5 would be renovated to be certifiable as LEED Silver (certification is based on a 100-point rating scale with simple certification requiring 40 points in addition to required elements and a silver certification requiring a minimum of 50 points). The focus of renovation is twofold—to meet the building program and LEED certification, and to have "no adverse effect" under Section 106 of the NHPA. In this scenario, the following design parameters and usages are the same as Scenario 2, and incorporate the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, including:

- Office and cubicle work spaces for approximately 250 people. The design should be flexible.
- Records and general office storage.
- Renovation of restrooms to upgrade and provide adequate number and floor spacing.
- Conference rooms.
- Small museum.
- Mechanical, electrical, plumbing, and communication systems would be replaced.
- Windows would be replaced to meet necessary ATFP requirements.
- Roof would be replaced.
- Necessary fire safety and ADA requirements would be met.
- Achieve energy efficiency requirements of the Energy Independence and Security Act 2007.
- Preserve the character-defining features of Building 5.

	Initial Costs	Total LCC and Energy/Year
Renovation	$4,435,200	
Average estimated energy costs		$39,046
Life Cycle Costs		$480,000 (includes initial construction costs)
Total	**$4,435,200**	**$519,046**

Note: The cost to register the building ($900), provide LEED documentation (est. $50,000) and receive certification ($1,200) is an additional $52,100 (1%). These costs are not included in the above estimates. Per DoD policy, buildings need to be certifiable, but not necessarily certified.

It is estimated that achieving the LEED Silver certification and preserving the historic integrity of Building 5 would add approximately $403,200, or 9% over the cost of standard renovation. The following tables include a cost-per-credit breakdown for the LEED strategy when these credits can be estimated (total $127,800). It is assumed that certain items in the LEED strategy would not substantially add to the renovation cost (i.e., locally available materials and low-VOC materials), and that other LEED strategy items (i.e., stormwater quality control) would need to be included in the design and construction program, and therefore are not itemized separately. It is estimated that additional items included in the design and construction program costs would add approximately 6%.

TABLE 4-2. ESTIMATED COSTS FOR LEED CREDITS

Sustainable Sites			
Credit No.	**Credit Category**	**Points Achieved**	**Added Cost to Achieve**
Prerequisite	Construction Activity – Pollution Prevention	X	Included in additional costs of design and construction program
Credit 1	Site Selection	1	0
Credit 4.2	Alternative Transportation – Bicycle Storage and Changing Room	1	$2,000 (showers and bike racks)
Credit 4.3	Alternative Transportation – Low-emitting and Fuel Efficient Vehicles	3	3 spaces with signs ($100 each) = $300
Credit 4.4	Alternative Transportation – Parking Capacity	2	0
Credit 5.1	Site Development – Protect or Restore Habitat	1	0
Credit 5.2	Site Development – Maximize Open Space	1	0
Credit 6.1	Stormwater – Quantity Control	1	Included in additional costs of design and construction program
Credit 7.1	Heat Island – Nonroof	1	$5,000 (hardscape reflective surface treatments or replace some surfaces with porous materials)
Credit 7.2	Heat Island – Roof	1	$6,000 (white roof)
	Total		**$13,800**

TABLE 4-2. (CONT.) ESTIMATED COSTS FOR LEED CREDITS

Water Efficiency			
Credit No.	**Credit Category**	**Points Achieved**	**Added Cost to Achieve**
Prerequisite	Water Use Reduction	X	Included in additional costs of design and construction program
Credit 1	Water Efficient Landscaping	4	0
Credit 2	Innovative Wastewater Technologies	1	$5,000 (low-flow fixtures)
Credit 3	Water Use Reduction	2	Included in additional costs of design and construction program
	Total		**$5,000**

TABLE 4-2. (CONT.) ESTIMATED COSTS FOR LEED CREDITS

Energy and Atmosphere			
Credit No.	**Credit Category**	**Points Achieved**	**Added Cost to Achieve**
Prerequisite	Fundamental Commissioning of Building Energy Systems	X	Included in additional costs of design and construction program
Prerequisite	Minimum Energy Performance	X	Included in additional costs of design and construction program
Prerequisite	Fundamental Refrigerant Management	X	Included in additional costs of design and construction program
Credit 1	Optimizing Energy Performance	10	$10,000 (additional insulation and infiltration treatments)
Credit 2	On-site Renewable Energy	2	$8,000 (solar hot water)
Credit 3	Enhanced Commissioning	2	$24,000
Credit 4	Enhanced Refrigeration Management	2	Included in additional costs of design and construction program
Credit 5	Measurement and Verification	3	$5,000
Credit 6	Green Power	2	$4,000 (credit purchase)
	Total		$51,000

TABLE 4-2. (CONT.) ESTIMATED COSTS FOR LEED CREDITS

Materials and Resources			
Credit No.	**Credit Category**	**Points Achieved**	**Added Cost to Achieve**
Prerequisite	Storage and Collection of Recyclables	X	Included in additional costs of design and construction program
Credit 1.1	Building Reuse—Maintain Existing Walls, Floors and Roof	3	Included in additional costs of design and construction program
Credit 2	Construction Waste Management	2	$15,000 (programming, sorting, storage and distribution)
Credit 3	Material Reuse	2	Included in additional costs of design and construction program
Credit 4	Recycled Content	2	$1,000 (flooring)
Credit 5	Regional Materials	2	0
	Total		**$16,000**

TABLE 4-2. (CONT.) ESTIMATED COSTS FOR LEED CREDITS

Indoor Environmental Quality			
Credit No.	**Credit Category**	**Points Achieved**	**Added Cost to Achieve**
Prerequisite	Minimum Indoor Air Quality Performance	X	
Prerequisite	Environmental Tobacco Smoke Control	X	
Credit 1	Outdoor Air Delivery Monitoring	1	$5,000 (monitoring equipment and installation)
Credit 2	Increased Ventilation	1	Included in additional costs of design and construction program
Credit 3.1	Construction Indoor Air Quality Management Plan—During Construction	1	$1,000 (protective measures)
Credit 3.2	Construction Indoor Air Quality Management Plan—Before Occupancy	1	Included in additional costs of design and construction program
Credit 4.1	Low-emitting Materials—Adhesives and Sealants	1	0
Credit 4.2	Low-emitting Materials—Paints and Coatings	1	0
Credit 4.3	Low-emitting Materials—Flooring Systems	1	0
Credit 4.4	Low-emitting Materials—Composite Wood and Agrifiber Products	1	0
Credit 6.1	Controllability of Systems—Lighting	1	$5,000 (additional lighting controls)
Credit 6.2	Controllability of Systems—Thermal Comfort	1	$5,000 (additional thermostats)
Credit 7.1	Thermal Comfort—Design	1	Included in additional costs of design and construction program
Credit 8.1	Daylight and Views—Daylight	1	$26,000 (ceiling treatments)
	Total		**$42,000**
	Project Total		**$127,800**

TABLE 4-2. (CONT.) ESTIMATED COSTS FOR LEED CREDITS

Innovation in Design			
Credit No.	**Credit Category**	**Points Achieved**	**Added Cost to Achieve**
Credit 1	Historic Preservation	1	Too variable to estimate
Credit 2	LEED Accredited Professional	1	Included in additional costs of design and construction program
	Total		

TABLE 4-2. (CONT.) ESTIMATED COSTS FOR LEED CREDITS

Regional Priority			
Credit No.	**Credit Category**	**Points Achieved**	**Added Cost to Achieve**
Credit 1	SS credit 1 – Site Selection	1	0
Credit 2	WE credit 1 - Water efficient landscaping	1	0
	Total		

The detailed LEED strategy checklists developed at the charrette are included in appendix C. Appendix E includes additional cost details for specific "green" products identified in the LEED strategy, and a list of local venders that sell these products.

4.5 FEASIBILITY, COMPARISON SUMMARY, AND CONCLUSIONS FOR BUILDING 5 CASE STUDY

This feasibility study supports the theory that achieving LEED Silver certification and having no adverse effect under Section 106 of the NHPA (preserving the historical integrity) to Building 5 is achievable (not considering ATFP constraints), both from sustainability and economic perspectives. This theory is possible, in part, due to prior alterations and modifications made to Building 5, its flat roof and parapet, and current setting.

4.5.1 Building 5 Historic Preservation Versus LEED Certification

When developing the proposal for the DoD Legacy Program project, volunteers from ARNG were asked to offer a building for the case study without benefit of vetting potential building candidates. Building 5 provided some advantages to achieving LEED and historic preservation goals that other historic buildings did not. First, when Building 5 was constructed, it was one of the primary and permanent structures at Stout Field and has a substantial exterior shell in good condition. Second, the windows in Building 5 have already been replaced and therefore are not a character-defining feature. Although new windows can be manufactured to resemble original windows, this can be more expensive, and therefore a design feature that could be removed from the program during a value analysis process. Lastly, Building 5 has a flat roof with a high parapet shielding the roof from view. The parapet would allow designers many options in developing a LEED strategy. Because the roof is hidden from view, it can accommodate solar panels;

skylights; a green roof for stormwater, additional greenscape, and/or energy efficiency; a highly reflective roof; and/or other equipment for achieving a variety of different LEED credits.

In addition, the interior and exterior of Building 5 have been altered: (1) additional wall and partitions have been added altering the original floor plan; (2) original bathroom fixtures, lighting, and flooring have been replaced; and (3) exterior hangar and bay doors were removed and filled. These modifications result in more flexibility in design and reuse options with little or no effect to remaining historic fabric. With careful design, insulation can be added to interior walls.

The greenscape surrounding Building 5 is sufficient for LEED certification—INARNG currently has a low maintenance landscape and does not water due to sufficient precipitation. Because of the campus setting, there are multiple and ample parking lots; therefore, no additional parking space is necessary.

The challenge with evaluating Building 5 for this study involves the ATFP requirements, e.g., for the J1 and Retention and Recruitment scenario being considered during the charrette, Building 5 would be defined as a primary gathering building—an inhabited building routinely occupied by 50 or more DoD personnel. The majority of Building 5 lies within the standoff distance area (an 82 ft controlled perimeter). The options for complying with the ATFP standards (modifying walls and windows, removing windows, and/or installing blast-proof walls) would likely have an adverse effect on the historic character of Building 5.

Due to the flexibility in the LEED system, the original design and construction of Building 5, and the modifications made to Building 5 over the years, LEED certification could be achieved without an adverse effect on the historic character of the building. However, meeting ATFP standards could have an adverse effect on the historic structure.

4.5.2 Building 5 – Investments and Cost Comparisons

Tables 4-3 and 4-4 compare the initial and LCC/energy costs for:

- Demolition and construction of a new building (Scenario 1) and renovation to meet LEED strategy and historic preservation goals (Scenario 3).
- Standard renovation of the building (Scenario 2) and renovation to meet LEED strategy and historic preservation goals (Scenario 3).

TABLE 4-3. COMPARISON OF SCENARIOS 1 AND 3

Initial Costs			
	Scenario 1	**Scenario 3**	**Benefit of Scenario 3**
Demolition	$220,000	N/A (interior demolition costs are included in new construction)	
New Construction	$4,960,800	$4,435,200	
Mitigation of Adverse Effect	$45,000	N/A	
Total	$5,225,800	$4,435,200	$790,600 (+18%) savings
LEED Cert New Construction Total	$5,597,860	$4,435,200	$1,162,660 (+21%) savings

TABLE 4-3 (CONT.) COMPARISON OF SCENARIOS 1 AND 3

Recurring Life Cycle Costs			
	Scenario 1	**Scenario 3**	**Benefit of Scenario 3**
Average Estimated Energy Costs	$44,788	$39,046	$5,742/yr (+15%) savings
Life Cycle Costs	$468,000	$480,000	-$12,000/yr (-3%)
Total	$512,788/yr $12,819,700/25 yrs	$519,046/yr $12,976,150/25 yrs	-$6,258/yr $156,450/25 yrs (-1%)
LEED Cert New Construction Total	$540,366/yr $13,509,150/25 yrs	$519,046/yr $12,976,150/25 yrs	$21,320/yr $533,000/25 yrs (+4%)

TABLE 4-4. COMPARISON OF SCENARIOS 2 AND 3

Initial Costs			
	Scenario 2	**Scenario 3**	**Benefit of Scenario 3**
Renovation	$4,032,000	$4,435,200	
Mitigation of Adverse Effect	$45,000	N/A	
Total	$4,077,000	$4,435,200	-$358,200 (-9%)

Table 4-4 (cont.) Comparison of Scenarios 2 and 3

Recurring Life Cycle Costs			
	Scenario 2	**Scenario 3**	**Benefit of Scenario 3**
Average Estimated Energy Costs	$45,936	$39,046	$6,890/yr (+15%)
Life Cycle Costs	$480,000	$480,000	0
Total	$525,936/yr $13,148,400/25 yrs	$519,046/yr $12,976,150/25 yrs	$6,890/yr $172,250/25 yrs (+1%)

Per scenario comparisons, renovating Building 5 to LEED Silver certification and preserving its historic integrity would have initial costs estimated to be approximately 9.0% more over conventional renovation. However, it would save an estimated 1.0% over the life of the building's energy costs. Renovating Building 5 to LEED Silver would be approximately 15.0% less in first costs, but result in a 1.0% increase in energy and LCC over the life of the building over construction of a new conventional office building. Renovating Building 5 to LEED Silver would be approximately 21.0% less in first costs, and would save an estimated 4.0% in energy and LCC costs of a new LEED-constructed office building due to increased first costs.

As discussed under section 4.4, without specific designs it is difficult to provide estimates for construction and renovations, so industry averages and percentages form the basis for these analyses. Where possible, specific products and strategies for LEED certification are estimated and included in table 4-1 and appendix E.

Registering, documenting, and receiving LEED certification for Building 5 or a replacement would result in an increased cost of 1.0% to 1.5% ($45,000–$52,000).

Another environmental cost consideration is energy costs embodied in the existing building that would be disposed in the landfill and the energy to produce and transport new materials. It is estimated that an office building has approximately 1,640 MBTUs per sq ft of embodied energy in materials and construction (http://www.thegreenestbuilding.org/), or 46,051,200 BTUs for Building 5. Using the Greenest Building organization's embodied energy calculator, to demolish Building 5 would require approximately 465,000,000 BTUs of energy and to construct a new building approximately the same size and of similar materials would expend another 42,900,000 BTUs.

Expended energy translated to about 377,087 gallons of gasoline[1] or an additional $972,885 (based on current prices in Indianapolis, Indiana, of $2.58/gallon).

4.5.3 Building 5 LEED Certification Summary

There are seven principle LEED credits applicable to the Building 5 analysis (see table 4-1): (1) Sustainable Sites, (2) Water Efficiency, (3) Energy and Atmosphere, (4) Materials and Resources, (5) Indoor Environmental Quality, (6) Innovation in Design, and (7) Regional Priority. Individual LEED credits for Building 5 were analyzed and discussed by professionals of pertinent disciplines using the charrette meeting format, resulting in detailed descriptions of credit value, intent, requirements, and potential technologies, and strategies (appendix C). Represented within the principle credits are 40 different LEED credit numbers of varying point values ranging from 1 to 10 with 110 possible credits (points).

During the charrette process, two groups evaluated potential actions and awarded each the corresponding LEED credits. Both groups achieved 61–67 points in separate analytical approaches; LEED Silver certification requires 50–59 points. The easiest credits to identify and enjoin into Building 5 renovation in terms of design and cost include: Site Selection; Alternative Transportation – Parking Capacity and Low-emitting and Fuel Efficient Vehicles; Site Development – Protect or Restore Habitat and Maximize Open Space; Stormwater – Quantity Control; Water Efficient Landscaping; Green Power; Material Reuse; Recycled Content; Regional Materials; Low-emitting Materials – Adhesives and Sealants, Paints and Coatings, Flooring Systems, and Composite Wood and Agrifiber Products; and LEED Accredited Professional. These easy-to-achieve project elements total approximately 27 LEED prerequisites and points or half the points required for LEED Silver certification.

The more difficult or challenging LEED credits are deemed so because of their design and construction needs and the funding that will be necessary to incorporate Building 5 renovations to LEED certification standards: Alternative Transportation – Bicycle Storage and Changing Room; Heat Island – Nonroof and Roof; Innovative Wastewater Technologies; Water Use Reduction; Optimizing Energy Performance; On-site Renewable Energy; Enhanced Commissioning; Enhanced Refrigeration Management; Measurement and Verification; Building Reuse – Maintain Existing Walls, Floors and Roof; Construction Waste Management; Material Reuse; Recycled Content; Outdoor Air Delivery Monitoring; Increased Ventilation; Construction Indoor Air Quality Management Plan – During Construction and Before Occupancy; Controllability of Systems – Lighting, Thermal Comfort, and Design; Daylight and Views – Daylight; and Historic Preservation. These more difficult to design and construct expensive project elements total approximately 41 LEED prerequisites and points.

[1] This MTWAS embodied energy calculator is based on the "Concept Model" presented in the ACHP's report, *Assessing the Energy Conservation Benefits of Historic Preservation: Methods and Examples*).

Overall, the significant challenge of the LEED system is the need to document compliance with the various criteria (credits) in order to submit a package to the USGBC for review and a decision on certification. Documentation requires establishment of a tracking and reporting system (often performed by a LEED consultant rather than the design and construction team) and researching and providing the information that otherwise is not standard practice in specifying or sourcing systems and materials. In one survey, an average of 226 work hours was required to complete the proper LEED documentation necessary for certification. Northbridge cites that in an article by USGBC and the NRDC, documentation was reported at $30,000 to $60,000 for teams working on their first LEED project, although costs could be as low as $10,000 for an experienced team. Northbridge found that architects and contractors were still learning how to provide proper documentation and many of their costs were going unreported and undocumented. Their research also identified documentation costs between $8,000 and $70,000 per project, with the range highly dependent on the experience of the team documenting the LEED process.

Relative to specific Building 5 renovation needs, not including project element design, the cost of building preparation and installation of new materials meeting LEED certification standards would total approximately $128,000. It was estimated that achieving LEED Silver certification would cost approximately $403,200 (total), or 9% over the cost of standard renovation.

4.6 CASE STUDY SUMMARY

This case study determines whether it is feasible to renovate a DoD historic building to achieve LEED Silver certification and preserve the historic integrity of the building. The objectives are twofold: (1) to determine if it is feasible to achieve sustainability and historic preservation goals, and (2) what are the costs to do so during renovation of INARNG Building 5. The following background points are important to inform LEED Silver certification of Building 5:

"Environmentalists cheer when used tires are incorporated into asphalt shingles and recycled newspapers become part of fiberboard. But when we reuse a historic building, we're recycling the whole thing" (Rypkema 2007).

- A new use for Building 5 as a readiness center (armory) has been proposed; however, previously this building was examined by architects and engineers to support the J1 Administration and Recruitment and Retention function. The feasibility study that forms the basis for this case study was completed using the original J1 Administration and Recruitment and Retention building program parameters and data. Therefore, the charrette and resulting LEED strategy was based on the renovation plans developed for the prior proposed use and no actual design has been developed for the proposed armory use.

- Life-cycle costing represents the method used herein to evaluate building investment projects. LCC is simply defined as the sum of initial building cost plus recurring and one-time (nonrecurring) costs over the full lifespan of the building (25 years).

- Mitigation of adverse effects to historic properties will total approximately $45,000 for each scenario evaluated.

- Under preferred Scenario 3 (renovation meeting LEED strategy certification, and historic preservation goals), Building 5 would be renovated to be certifiable as LEED Silver. The focus of renovation is twofold: (1) meet the building program and LEED certification standards, and (2) have "no adverse effect" under Section 106 of the NHPA. The total Scenario 3 cost with mitigation would include approximately $4,435,200. Average estimated energy costs and life cycle costs for this scenario would total $519,046 annually.

Under Scenario 1 (new building construction) the existing Building 5 would be demolished and land-filled (costing $220,000) and new construction of a similar-sized building designed for the armory mission would cost approximately $4,960,800. The total Scenario 1 cost with mitigation would include approximately $5,225,800. Average estimated energy costs and LCCs for this scenario would total approximately $512,788. When compared with Scenario 3 (renovation meeting LEED strategy certification and historic preservation goals) there is an 18% ($790,600) benefit/savings in initial costs under Scenario 3 and a 21% benefit ($1,162,660) benefit/savings under LEED certification for new construction under Scenario 3. Recurring LCCs (average estimated energy costs and LCC) over 25 years would total $13,509,150 for Scenario 1 and $12,976,150 for Scenario 3, resulting in a 4% savings ($533,000) under Scenario 3.

Under Scenario 2 (standard building renovation), the existing Building 5 would be renovated with standard industry practices, but not to meet LEED certification standards, achieve higher energy efficiency, or preserve the historic building fabric. The renovation focus would meet the building program needs to accommodate work and supporting space for 250 people. The total Scenario 2 cost with mitigation would include approximately $4,077,000. Average estimated energy costs and LCC for this scenario would total approximately $525,936. When compared with Scenario 3 (renovation meeting LEED strategy certification and historic preservation goals) there is a 9% ($358,200) benefit/savings in initial costs under Scenario 2. Recurring LCCs (average estimated energy costs and LCC) over 25 years would total $13,148,400 for Scenario 2 and $12,976,150 for Scenario 3, resulting in a 1% savings ($172,250) under Scenario 3.

The new LEED rating systems have more flexibility for meeting credit requirements, and in some renovation projects, LEED-EB, which focuses more on operations and maintenance, may be a more appropriate rating system. However, some professionals believe LEED is too conservative to award value to retaining existing materials and character, and embodies energy and the social and cultural stewardship required to be sustainable and "not do harm to future generations." When determining to preserve historic integrity and/or pursue LEED certification, both decisions will likely be based on budget considerations.

4.7 CONCLUSION

The DoD must achieve greater goals of energy efficiency improvements in both existing and new facilities. The DoD is directed to advance national energy security and environmental performance through achieving several goals including reducing energy intensity, petroleum consumption in fleet vehicles, GHG, water consumption, and the use of hazardous chemicals and toxic materials. Building renovations must be conducted in accordance with sustainability strategies, including resource conservation, reduction, and use; siting; and indoor environmental quality.

The reuse of an existing building maximizes resource conservation. By avoiding any demolition associated with new construction, the renovation project reduces materials destined for a landfill and reuses substantial portions of the existing building. Historic buildings, therefore, are inherently

sustainable because their preservation maximizes the use of existing materials and infrastructure, reduces waste, and preserves the historic character of older installations.

This feasibility study supports the theory that achieving LEED Silver certification and having no adverse effect under Section 106 of the NHPA (preserving the historical integrity) to Building 5 is achievable (not considering ATFP constraints), both from sustainability and economic perspectives. This is possible for Building 5, in part, due to prior alterations and modifications, its flat roof and parapet, and current setting.

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APPENDIX A: REGULATIONS, POLICY, GUIDANCE

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APPENDIX A: REGULATIONS, POLICY, AND GUIDANCE

REGULATORY OVERVIEW

Military leaders, planners, designers, environmental compliance specialists, and contractors are responsible for integrating and complying with numerous complex laws, regulations, policies, and guidance into their respective operations and programs. A brief summary of the key laws, regulations, executive orders, policies, and guidance applicable to this case study are provided below.

National Historic Preservation Act

The NHPA is the centerpiece of federal legislation protecting cultural resources. In the act, Congress states that the federal government will "provide leadership in the preservation of the prehistoric and historic resources of the United States," including resources that are federally owned, administered, or controlled. For this project, Section 106 of the act provides the foundation for INARNG management of Building 5 as a historic property.

Section 106

Section 106 of the NHPA requires the federal government to take into account the effects of its actions or programs, specifically on historic properties prior to implementation. This requirement applies to all proposed actions on federal lands and any proposed activities that are federally supported. Consultation with the SHPO and/or the ACHP is a critical step in this process. Activities on lands held by a federally recognized American Indian tribe with a designated Tribal Historic Preservation Officer (THPO) must be coordinated with this official. If an undertaking on federal lands may affect properties having historic value to a federally recognized American Indian tribe, such tribe shall be afforded the opportunity to participate as consulting parties during the consultation process defined in 36 CFR 800. Compliance can also be accomplished using agreed-upon streamlined methods and agreement documents such as programmatic agreements.

The Section 106 process is designed to identify possible conflicts between historic preservation objectives and the proposed activity, and to provide conflict resolution in the public interest through consultation. Neither NHPA nor ACHP regulations require that all historic properties must be preserved. They only require the agency to consider the effects of the proposed undertaking prior to implementation.

Failure to take into account the effects of an undertaking on historic properties, and afford the ACHP a reasonable opportunity to comment on such effects, can result in formal notification from the ACHP to the head of the federal agency of foreclosure of the ACHP's opportunity to comment on the undertaking pursuant to the NHPA. A notice of foreclosure can be used by litigants against the federal agency in a manner that can halt or delay critical activities or programs.

Once the federal agency first determines that the proposed federal action is an undertaking as defined in §800.16(y) and, if so, that the type of action that has the potential to cause effects on historic properties, the federal agency completes the process for compliance with Section 106 consisting of the following steps:

1. Identification of Historic Properties. Identification of historic properties within the area of potential effect (APE) is accomplished through review of existing documentation, field surveys, and consultation with the SHPO/THPO, federally recognized American Indian tribes, and other parties.

2. Property Evaluation. Evaluation of the identified historic properties using NRHP criteria (36 CFR Part 63) in consultation with the SHPO/THPO, federally recognized American Indian tribes, if applicable, and if necessary, the ACHP. Properties that meet the criteria will be considered "eligible" for listing in the NRHP and will be subject to further review under Section 106. Properties that do not meet the criteria will be considered "not eligible" for listing in the NRHP and will not be subject to further Section 106 review. For purposes of the NHPA, properties that have been listed in the NRHP or have been determined eligible for listing in the NRHP are designated "historic properties." Historic properties can therefore include archaeological sites, objects, districts, natural areas, and properties of traditional, religious, or cultural importance in addition to historic-period structures.

3. Determination of Effect. Assess the effects of the proposed project on the properties that were determined to meet NRHP criteria, in consultation with the SHPO/THPO and, if necessary, the ACHP. One of the following effect findings will be made:

   a) *No Historic Properties Affected*. If no historic properties are found or no effects on historic properties are found, the agency official provides appropriate documentation to the SHPO/ THPO and notifies consulting parties. However, the federal agency must proceed to the assessment of adverse effects when it finds that historic properties may be affected or the SHPO/THPO or ACHP objects to a "no historic properties affected" finding. The agency must notify all consulting parties and invite their views.

      When the criteria of adverse effect are applied (36 CFR 800.5[a]), and it is found that historic properties will not be adversely affected by the undertaking, the agency may make a finding of "no adverse effect." This finding is submitted to the SHPO for concurrence.

      The ACHP will not review "no adverse effect" determinations on a routine basis. The ACHP will intervene and review "no adverse effect" determinations if it deems it appropriate, or if the SHPO/THPO or another consulting party and the federal agency disagree on the finding and the agency cannot resolve the disagreement. If federally recognized American Indian tribes, other consulting American Indian tribes, or Native Hawaiian organizations disagree with the finding, they can request an ACHP review directly, but this must be done within the 30-day review period.

      Agencies must retain records of their findings of no adverse effect and make them available to the public. The public should be given access to the information when they so request, subject to the Freedom of Information Act (FOIA) and other statutory limits on disclosure, including the confidentiality provisions in Section 304 of the NHPA. Failure of the agency to carry out the undertaking in accordance with the finding requires the agency official to reopen the Section 106 process and determine whether the altered course of action constitutes an adverse effect.

   b) *Historic Properties Adversely Affected*. Adverse effects occur when an undertaking may directly or indirectly alter characteristics of a historic property that qualify it for inclusion in the NRHP. Reasonably foreseeable effects caused by the undertaking that may occur later in

time, be farther removed in distance, or be cumulative also need to be considered. The finding of "historic properties adversely affected" is submitted to the SHPO/THPO for concurrence. The SHPO/THPO may suggest changes in a project or impose conditions so that adverse effects can be avoided and thus result in a no adverse effect determination.

c) *Resolution of Adverse Effects/Mitigation*. When adverse effects are found, the consultation must continue among the federal agency, SHPO/THPO, and consulting parties to attempt to resolve them. The agency official must notify the ACHP when adverse effects are found and should invite the ACHP to participate in the consultation when the circumstances in 36 CFR 800.6(a)(1)(i)(A)–(C) exist. A consulting party may also request the ACHP to join the consultation.

When resolving adverse effects without the ACHP, the agency official consults with the SHPO/THPO and other consulting parties to develop a memorandum of agreement (MOA). The MOA will outline the steps or actions to be taken prior to implementation of the project in order to mitigate adverse effects on the historic property. Stipulations included in a MOA may include (but are not limited to) documentation, modification of the project to lessen the adverse effects on the property, efforts to sell or relocate the resource, or step-by-step consultation with interested parties throughout the process to ensure it is carried out according to plan.

The MOA is executed between the agency official and the SHPO/THPO, and filed with the required documentation with the ACHP. This filing is the formal conclusion of the Section 106 process and must occur before the undertaking is approved.

For this project, the primary goal was to have a determination of "no adverse effect" from the renovation on Building 5. This project will not suffice for the Section 106 process; however, it provides early coordination with the SHPO through participation in the design charrette.

Executive Order 13287: Preserve America

This executive order directs federal agencies to provide leadership in preserving U.S. heritage by actively advancing the protection, enhancement, and contemporary use of the historic properties owned by the federal government; promoting intergovernmental cooperation and partnerships for the preservation and use of historic properties; inventorying resources; and promoting ecotourism.

Executive Order 13327: Federal Real Property Asset Management

Expressing the goal of promoting efficient and economical use of real property assets and ensuring management accountability and reforms, Executive Order 13327 requires federal agencies to develop and submit asset management plans that incorporate the management requirements for historic property found in Executive Order 13287 (3 March 2003), and the environmental management requirements found in Executive Order 13148 (21 April 2000). The new executive order also establishes the Federal Real Property Council, which is tasked to consider environmental costs associated with ownership of property, including restoration and compliance costs.

Executive Order 11593: Protection and Enhancement of the Cultural Environment

This executive order requires federal agencies to provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation by initiating necessary measures to preserve, restore, and maintain federally owned sites, structures, and objects of historical, architectural, or archaeological significance (for the inspiration and benefit of the people).

Energy Independence and Security Act of 2007

The Energy Independence and Security Act of 2007 is significant legislation designed to increase energy efficiency standards and the availability of renewable energy. The act directs federal agencies to meet federal standards in fuel, equipment, and the building envelope, and future fleet (vehicle) selection when upgrading Building 5.

Title III: Energy Savings Through Improved Standards for Appliances and Lighting

Subtitle A, Appliance Energy Efficiency
Although the majority of this subtitle applies to residential buildings, federal agencies are herein directed to purchase devices that limit standby power use.

Subtitle B, Lighting Energy Efficiency
Section 323 establishes energy efficient standards for lighting fixtures and bulbs in federal buildings. Lighting fixtures and bulbs are further defined as being energy efficient if they have the Energy Star label, light-emitting diode system (LED), or systems meeting the requirements for Energy Star certification, or approved by the Secretary of Energy.

Title IV: Energy Savings in Buildings and Industry

Subtitle C, High-Performance Federal Buildings
Section 432 demands that major renovations in federal buildings, for which Building 5 qualifies, reduce fossil fuel energy use 55% by 2010 from a 2003 baseline. Fossil fuels are to be eliminated (100% reduction) by 2030. The most energy efficient designs, equipment, systems, and controls must be used in HVAC systems and other installed equipment, as well as in renovations of existing space. This subtitle also calls for the establishment of an Office of Federal High-Performance Green Buildings to coordinate green building information and activities within the GSA and with other federal agencies. This office is charged with developing standards for federal facilities, establishing green practices, reviewing budget and life-cycle costing issues, and promoting demonstration of innovative technologies. The General Accounting Office (GAO) will audit these activities. Facilities with a footprint exceeding 5,000 sq ft are directed to use site planning, design, construction, and maintenance strategies to control stormwater runoff.

Title V: Energy Savings in Government and Public Institutions

Subtitle B, Energy Savings Performance Contracting
Federal agencies are restricted to limiting the duration of energy savings performance contracts (ESPCs) to less than 25 years, or limiting the total amount of obligations. Existing ESPCs must conform to these requirements as well. The criteria for energy savings verification may be used to meet the requirement for energy audits. The definition of energy savings reduction is extended to include increased use of existing electrical, thermal, and water resources.

Subtitle C, Energy Efficiency in Federal Agencies
Section 523 requires that 30% of the hot water demand in major renovations be met with solar hot water equipment, provided it is life-cycle cost-effective. Minimizing standby energy use should be considered when purchasing energy-using equipment. Federal purchasing should focus on Energy Star and Federal Energy Management Program (FEMP)-designated products. Federal agencies subject to this subtitle must issue an annual report describing the status of initiatives to improve energy efficiency, reduce energy costs, and reduce GHG emissions.

Executive Order 13423: Strengthening Federal Environmental, Energy, and Transportation Management

This executive order directs federal agencies to advance national energy security and environmental performance through achieving several goals. Federal agencies must reduce energy intensity, petroleum consumption in fleet vehicles, GHG emissions, water consumption, and use of hazardous chemicals and toxic materials. Alternative fuel consumption and renewable energy purchases must be increased. Building renovations must be carried out in accordance with sustainability strategies, including resource conservation, reduction, and use; siting; and indoor environmental quality. Electronic products must meet guidelines established in this executive order and used electronic equipment will be disposed of in an environmentally sound manner. Federal agencies will implement environmental management systems at appropriate organizational levels to ensure internal operations and activities comply with environmental regulations.

Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding, OMB Circular A-11

This memorandum establishes the expectation that federal agencies build and maintain energy efficient and environmentally sensitive buildings according to LEED criteria. Implementing Executive Order 13423, the memorandum states that all new buildings and major renovations as of 1 October 2008 must achieve sustainability through LEED Gold Standard certification. The requirement applies to projects at Critical Decision-One stage or lower with a value exceeding $5 million, and the memorandum goes on to qualify the term "major renovation." Additionally, 15% of existing real property must comply with Executive Order 13423.

DEPARTMENT OF DEFENSE POLICIES, PLANS, MEMORANDUM, AND GUIDANCE

2007 Defense Installations Strategic Plan

The 2007 Defense Installations Strategic Plan lays out several goals to promote the transformation of the military to meet current and future national security threats. Environmental sustainability is a critical component of mission capabilities. The plan calls for revitalization of existing buildings and encourages longer-term facility standards. This includes restoring and modernizing those facilities such as Building 5. Federal agencies must retain and restore "cost effective, sustainable, energy-efficient, and safe infrastructure that meets anticipated operational requirements over expected service life."[2] Historic resources and cultural assets must be managed both to support missions and for the benefit of future generations. Additionally, federal agencies must meet ATFP criteria. The plan requires DoD installations to comply with Executive Order 13423 and the Energy Policy Act of 2005 and reduce energy use and reliance on fossil fuels.

Unified Facilities Criteria, DoD Minimum Antiterrorism Standards for Buildings, UFC 4-010-01, 8 October 2003, Including Change 1, 22 January 2007

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to military departments, defense agencies, and DoD field activities, in accordance with USD (AT&L) Memorandum dated 29 May 2002.

[2] Office of the Deputy Under Secretary of Defense (Installations and Environment), *2007 Defense Installations Strategic Plan*, 1 January 2007, www.acq.osd.mil/ie/download/DISP2007_final.pdf, (21 July 2009) p. 10.

The intent of UFC 4-010-01, DoD Minimum ATFP is to minimize the possibility of mass casualties in buildings or portions of buildings owned, leased, privatized, or otherwise occupied, managed, or controlled by or for the DoD. These standards provide appropriate, implementable, and enforceable measures to establish a level of protection against terrorist attacks for all inhabited DoD buildings where no known threat of terrorist activity currently exists. While complete protection against all potential threats for every inhabited building is cost prohibitive, the intent of these standards can be achieved through prudent master planning, real estate acquisition, and design and construction practices.

There are several major design strategies that are applied throughout these standards. They do not account for all measures considered in these standards, but they are the most effective and economical in protecting DoD personnel from terrorist attacks. These strategies are summarized below:

- Maximize Standoff Distance. The primary design strategy is to keep terrorists as far away from inhabited DoD buildings as possible. The easiest and least costly opportunity for achieving the appropriate levels of protection against terrorist threats is to incorporate sufficient standoff distance into project designs. While sufficient standoff distance is not always available to provide the standoff distances required for conventional construction, maximizing the available standoff distance always results in the most cost-effective solution. Maximizing standoff distance also ensures that there is opportunity in the future to upgrade buildings to meet increased threats or to accommodate higher levels of protection.

- Prevent Building Collapse. Provisions relating to preventing building collapse and building component failure are essential to effectively protect building occupants from injury or death. Those provisions apply regardless of standoff distance or the buildings resistance to blast effects. Designing those provisions into buildings during new construction or retrofitting during major renovations, repairs, restorations, or modifications of existing buildings is the most cost effective time to do that. In addition, structural systems that provide greater continuity and redundancy among structural components will help limit collapse in the event of severe structural damage from unpredictable terrorist acts.

- Minimize Hazardous Flying Debris. In past explosive events where there was no building collapse, a high number of injuries resulted from flying glass fragments and debris from walls, ceilings, and fixtures (nonstructural features). Flying debris can be minimized through building design and avoidance of certain building materials and construction techniques. The glass used in most windows will break at very low blast pressures, resulting in hazardous, dagger-like shards. Minimizing those hazards through reduction in window numbers and sizes and through enhanced window construction has a major effect on limiting mass casualties. Window and door designs must treat glazing, frames, connections, and the structural components to which they are attached as an integrated system. Hazardous fragments may also include secondary debris such as those from barriers and site furnishings.

- Provide Effective Building Layout. Effective design of building layout and orientation can significantly reduce opportunities for terrorists to target building occupants or injure large numbers of people.

- Limit Airborne Contamination. Effective design of HVAC systems can significantly reduce the potential for chemical, biological, and radiological agents being distributed throughout buildings.

- Provide Mass Notification. Providing a timely means to notify building occupants of threats and the appropriate response to those threats reduces the risk of mass casualties.

- Facilitate Future Upgrades. Many of the provisions of these standards facilitate opportunities to upgrade building protective measures in the future if the threat environment changes.

Department of the Army Memorandum: Sustainable Design and Development Policy Update – SPiRiT to LEED Transition, 5 January 2006

This memorandum discusses integrating principles and practices of sustainability into Army installations and transitioning from the Sustainable Project Rating Tool to the LEED rating system. Beginning in FY 2008, all vertical construction projects must achieve LEED Silver certification. Projects prior to FY 2008 may continue to use SPiRiT and must achieve the Gold level, although they may be scored through LEED New Construction if the Silver level is achievable.

Department of the Army Memorandum: Sustainable Design and Development Policy Update – Life Cycle Costs, 27 April 2007

This memorandum updates the SDD policy for Army facilities and uses LCCs to reduce total ownership costs. LCCs are defined as "the total cost related to energy conservation measures of owning, operating, and maintaining a building over its useful life as determined in accordance with 10 CFR part 436."[3] The memorandum upholds the existing policy requiring new construction beginning with FY 2008 to achieve, at a minimum, the LEED New Construction Silver level rating (certification is not required). Existing buildings undergoing renovations exceeding $7.5 million must achieve the certification level of the LEED Existing Buildings rating system (certification is not required). Additional policy regarding the appropriate rating level for LEED Existing Buildings will be issued once the Department of the Army makes a determination. Major renovations without completed concept designs as of the issuance of this memorandum must reduce energy consumption levels by 20% below the pre-renovations 2003 baseline.

Army Strategy for the Environment – Sustainable Army

This strategy focuses on transitioning from a compliance-based environmental program to a mission-based approach, speaking to the interdependence of environment, mission, and community. Calling for the employment of such practices as water conservation and fuel and energy efficiency, this document explains that incorporating sustainability into facilities, systems, and materials will reduce LCCs as well as the impact on the environment. Performance and compliance will be monitored through the ISO 14001 Environmental Management System Standard. Similar ethics of sustainability are expected of contractors and corporate partners. Responsible cultural resource management is a connecting link between a sustainable future and a commitment to the community. An integrated planning process identifying objectives, initiatives, monitoring, and assessment tools will allow the Army to work toward these goals.

Department of the Air Force Memorandum: Air Force Sustainable Design and Development Policy, 31 July 2007

This policy memorandum, consistent with Executive Order 13423 and the Energy Policy Act of 2005, seeks to "reduce the environmental impact and total ownership cost of facilities; improve energy efficiency and water conservation; and provide safe, healthy, and productive built environments."[4] All Air

[3] Department of the Army, "Sustainable Design and Development Policy Update – Life Cycle Costs," Memorandum, 27 April 2007, www.acsim.army.mil/operations/docs/facilitiespolicy/Sustaina.pdf, p. 1.
[4] Department of the Air Force, "Air Force Sustainable Design and Development (SDD) Policy," Memorandum

Force construction projects shall use the USGBC LEED Green Building Rating System as their self-assessment metric.

Beginning in FY 2009, all military construction (MILCON) projects must be evaluated by a LEED-accredited professional and found compliant. In FY 2009, 5% of total MILCON shall be selected for formal LEED registration and certification (this increases to 10% in FY 2010). Additionally, also beginning in FY 2009, all MILCON vertical construction projects shall be designed with the capability of achieving LEED Silver certification.

Department of the Navy, NAVFAC Instruction 9830.1, Sustainable Development Policy, 09 June 2003

This policy memorandum has the purpose to reduce the total cost of ownership of shore facilities by implementing sustainable development concepts and principles by incorporating sustainable development concepts and principles I planning, design, construction and maintenance, sustainment, restoration and modernization of all facilities. The memorandum states that the Navy shall use LEED as a tool in applying sustainable development principles.

Beginning in FY 2009, all MILCON projects must be evaluated by a LEED-accredited professional and found compliant. In FY 2009, 5% of total MILCON shall be selected for formal LEED registration and certification (this increases to 10% in FY 2010). Additionally, also beginning in FY 2009, all MILCON vertical construction projects shall be designed with the capability of achieving LEED Silver certification.

GUIDANCE FOR TREATMENT OF HISTORIC PROPERTIES - SECRETARY OF THE INTERIOR'S STANDARDS FOR THE TREATMENT OF HISTORIC PROPERTIES

The *Secretary of the Interior's Standards for the Treatment of Historic Properties* embody two important goals: (1) the preservation of historic materials, and (2) the preservation of the distinguishing character of a building. *Character* refers to all those visual aspects and physical features that comprise the appearance of every historic building. Character-defining elements include the overall shape of the building, its materials, craftsmanship, decorative details, interior spaces and features, as well as the various aspects of its site and environment. Every old building is unique, with its own identity and its own distinctive character.

The Standards for Rehabilitation (codified in 36 CFR 67) address the most prevalent treatment. "Rehabilitation" is defined as "the process of returning a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property that are significant to its historic, architectural, and cultural values."

Initially developed by the Secretary of the Interior to determine the appropriateness of proposed project work on registered properties within the Historic Preservation Fund grant-in-aid program, the Standards for Rehabilitation have been widely used over the years—particularly to determine if a rehabilitation qualifies as a Certified Rehabilitation for federal tax purposes. In addition, the standards have guided federal agencies in carrying out historic preservation responsibilities for properties in federal ownership or control; and state and local officials in reviewing both federal and nonfederal rehabilitation proposals. The standards have also been adopted by historic district and planning commissions across the country.

The intent of the standards is to assist the long-term preservation of a property's significance through preservation of historic materials and features. The standards (Department of the Interior regulations,

31 July 2007, http://www.afcee.af.mil/shared/media/document/AFD-090713-076.pdf, p. 1.

36 CFR 67) pertain to historic buildings of all construction types, materials, sizes, and occupancy, and encompass the exterior and interior, related landscape features and the site and environment of the building, as well as attached, adjacent, or related new construction. The standards are to be applied to specific rehabilitation projects in a reasonable manner, taking into consideration economic and technical feasibility.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.
2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.
4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.
6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
7. Chemical or physical treatments such as sandblasting that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
8. Significant archaeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the mass, size, scale, and architectural features to protect the historic integrity of the property and its environment.
10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

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APPENDIX B: BRIEF HISTORY OF STOUT FIELD AND BUILDING 5

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APPENDIX B: BRIEF HISTORY OF STOUT FIELD AND BUILDING 5

INDIANAPOLIS STOUT FIELD BUILDING 5

Historic Context

The following historic context is from the *Architectural Preservation Maintenance and Treatment Plan – Building 5, Stout Field, Indianapolis, IN*, prepared by Gary & Pape, Inc., and ATA/Beilharz, completed in May 2009.

Stout Field History

The history of Stout Field began in the mid-1920s, when a group of prominent Indianapolis businessmen formed the Indianapolis Airport Corporation to establish an airport in the city (Marlette and Dalton 1994:998). The leader of this group was J.A. Goodman, one of the founders of the Real Silk Company, a successful hosiery manufacturing firm based in Indianapolis (Marlette and Dalton 1994:998 and Brockman 1994). The group leased 254 acres of farmland southwest of the city center for use as the first municipal airport serving Indianapolis. This land was in turn leased to the Indiana State Armory Board in October 1926, and operated as a joint commercial and military airfield (Marlette and Dalton 1994:998). The airport was operated by the officers of the 113th Observation Squadron of the Indiana National Guard.

Organized in Kokomo, Indiana, in 1921, the 113th Observation Squadron disbanded in the spring of 1926, but reorganized in Indianapolis in June 1926. When the squadron established its headquarters at the newly created airport, hangars, and other equipment were moved from Kokomo to the Indianapolis site (Riker 1952:208).

The airport was initially named Cox Field in honor of a local World War I pilot, but it was also known as Mars Hill Airport, National Guard Flying Field, and Indianapolis National Guard Airport (Fischer 1994:1301). It was not until 1929 that Cox Field was renamed Stout Field. Richard H. Stout was born in Indianapolis and enlisted in the French Army before the United States joined World War I. During his service with the French, Lieutenant Stout received the Croix de Guerre, as well as gold, silver, and bronze stars for "bravery under fire." When the United States entered World War I, Stout transferred to the U.S. Army as a driver in the Ambulance Service. He later enlisted in the aviation branch of the Signal Corps. After the war, Stout was commissioned in the Air Service Officer's Reserve Corps. In 1926, he joined the Indiana National Guard as a member of the 113th Observation Squadron. On 3 October 1926, Stout was killed when his plane crashed at Shoen Field in Fort Harrison, Indiana (Thole 1996:89).

On 17 December 1927, Embry-Riddle, which operated an airmail service between Cincinnati and Chicago, became the first airline to fly out of Stout Field. In 1928, the Curtiss Flying Service of Indiana leased a portion of Stout Field to operate a passenger service and flying school. In 1929, the Curtiss Flying Service built a combination hangar and administration building (now known as Building 8) at Stout Field. On 7 July 1929, Stout Field became a stop for the Transcontinental Air Transport (TAT). The TAT, which was linked to the Curtiss Flying Service, used its hangar at Stout Field for emergency repairs, and offered a combination rail and air trip from New York City to Los Angeles (BB&E 2006:15).

During the summer of 1928, the Indianapolis Chamber of Commerce and City Council began discussing the establishment of another airport in the city. Stout Field was not large enough to handle the growing air

traffic, and Indianapolis wanted to have its own airport rather than share space with the military. In 1929, the city purchased land for the new airport approximately 2 miles west of Stout Field. Air service began at the new field on 16 February 1931, when TAT moved its operations from Stout Field. After establishment of the new airport, the city relinquished its ownership in Stout Field and the Indiana National Guard became the sole owner of the facility (Marlette 1994b:787).

Between 1931 and the advent of World War II, the Indiana National Guard, led by the 113th Observation Squadron, made improvements to Stout Field. In 1940, the state adjutant general, Elmer F. Straub, obtained a WPA grant of $1,249,000 to construct new buildings and make other improvements at Stout Field. The State of Indiana contributed $87,000 to these projects, which included construction of an administration building, a new hangar, a drainage system, four new runways, fuel storage facilities, and night-flying lights. In addition, the plan called for the application of brick veneer to the hangars that had been moved to Stout Field from Kokomo in the 1920s, as well as the purchase of 50 acres to expand the field (BB&E 2006:24).

Several hundred WPA workmen were sent to Stout Field in December 1940 to complete the projects, with more crews being added as necessary (Indianapolis News 1940a). As many as 600 men worked on these WPA projects (Thole 1996:89). Most of the work was completed by April 1941, although construction of the buildings did not begin until July 1941 (Riker 1952:209-210). In January 1941, the 113th Observation Squadron was sent to Key Field in Mississippi by a presidential executive order, leaving Stout Field vacant (BB&E 2006:24). Although the future of the field was undetermined, work continued.

On 7 April 1942, the U.S. government leased Stout Field from the State of Indiana for use by the U.S. Army Air Corps (Riker 1952:210). The original tenure of the lease dated from 7 April to 30 June 1942, and was renewable annually for $1.00. The federal occupancy of Stout Field was not to extend more than six months beyond the date when the president declared the current national emergency over. In any event, the lease would not extend beyond 30 June 1966.

The state initially retained hangars 1, 2, and 3 for storage; however, on 3 September 1942, a supplemental lease agreement specified that the U.S. government would be permitted to use hangar 3 and would pay to have the state's materials moved to hangar 2. Two additional supplemental agreements, dated 1 January and 15 March 1943, gave the federal government exclusive use of hangars 1 and 2, thus removing all state business from Stout Field (Abstract of Lease and Supplemental Agreements Between the United States of America and the State of Indiana Covering Occupancy of Stout Field 1943).

During World War II, the 1st Troop Carrier Command established its headquarters at Stout Field. The command was responsible for airborne operations, transporting glider-borne and parachute-borne troops and equipment into battle, and evacuating the wounded. The command's headquarters at Stout Field coordinated and directed the training of over 20,000 troops at 12 bases throughout the country, including those at Atterbury Army Air Field in Columbus, Indiana; Baer Field in Fort Wayne, Indiana; Bowman Field in Louisville, Kentucky; Lawson Field near Fort Benning, Georgia; and Bergstrom Field in Austin, Texas (BB&E 2006:25).

Stout Field not only became a training facility, it served as a destination for wounded soldiers and may have been involved in the planning of the D-Day invasion of Normandy. Wounded troops on their way to Billings General Hospital at Fort Harrison or Wakeman General Hospital at Camp Atterbury, arrived by air at Stout Field, then were transferred to these hospitals by ambulance. Planes carrying the wounded had landing priority over all other aircraft (Thole 1996:95). The 1st Troop Carrier Command likely participated in planning the D-Day invasion because its headquarters was "the primary planning and administrative component for airborne troop logistics leading up to the invasion of Europe" (BB&E 2006:26).

During World War II, approximately 2,000 civilian and 1,600 military personnel worked at Stout Field. The large number of people working and living at the base required housing facilities. By December 1942, 121 buildings had been constructed at Stout Field, including 43 barracks. Eventually, about 150 temporary buildings were constructed at Stout Field in the 1940s. After the war, from 1946 until the early 1950s, an 80-acre site adjacent to Stout Field was transitioned to civilian housing.

The site, which contained 137 temporary buildings, became known as Tyndall Towne. The state purchased the property for $1,450 and demolished the houses—the property is now part of Stout Field (BB&E 2006:26 and Thole 1996:95).

By August 1945, most war training at Stout Field ceased. A few months later, in January 1946, the 1st Troop Carrier Command was merged into the 9th Troop Carrier Command, and its headquarters transferred to Greenville, South Carolina. At this date, Stout Field came under the command of the 11th Air Force; however, only a skeleton crew remained at the base (Thole 1996:98). Stout Field officially was deactivated by the U.S. Army Air Corps on 9 May 1947 (Riker 1952:xiv). At this date, Stout Field again became the headquarters of the Indiana National Guard (BB&E 2006:30).

In 1948, the Indiana National Guard purchased 146 acres to expand the northeast/southwest runway to facilitate jet aircraft. However, even with the additional land, the runway could not properly handle larger aircraft. The Indiana National Guard sold the property in 1953 for $197,000, and used the proceeds to extend Hulman Field in Terre Haute for jet traffic. In 1956, the Indiana National Air Guard headquarters were transferred from Stout Field to Hulman Field (BB&E 2006:31-33).

Until 1964, some Indiana National Guard, as well as Indiana State Police and Highway Department, aircraft used Stout Field (Freeman 2007). In 1964, the state police moved to a new location within Indianapolis. Beginning in the 1950s, air traffic at Stout Field began to decrease. Finally, in 1971, the Indiana National Guard ended all air operations at Stout Field (Fischer 1994:1302). By 1977, all land not used by the Guard was sold. Some areas of Stout Field became an industrial park with warehouse-type buildings using the former concrete runways as building foundations (Freeman 2007). Today, Stout Field continues to serve as the headquarters of the Indiana National Guard and is home to many of its units (Fischer 1994:1302).

Building 5

Building 5 was part of the large building plan for Stout Field enacted under the National Defense Act in 1940–1941. Between July 1940 and June 1943 the WPA helped construct 215 airports and retrofit another 160 airports throughout the country. By March 1941, 500,000 WPA employees were working on defense projects, many of which entailed the expansion of military bases and airports (Smith 2006:207-208). In 1940, Elmer F. Straub, the state adjutant general, obtained a $1,249,000 WPA grant for improvements to Stout Field. The State of Indiana contributed $87,000 to the Stout Field improvements.

Besides infrastructure improvements to Stout Field, the project called for construction of an administration building (Building 5) and a hangar (Building 9). WPA workers began constructing these buildings in July 1941 (Riker 1952:209-210). The buildings were designed by local architect John P. Parrish. Parrish also co-designed the Heslar Naval Armory in Indianapolis and the Michigan City Armory with Benjamin H. Bacon in 1937.

When the U.S. government leased Stout Field in April 1942, buildings 5 and 9 were not yet complete. According to the U.S. Army, the work was slow because "under the existing wage scale paid by this organization [WPA] it was practically impossible to secure the necessary skilled and unskilled help needed to bring about the rapid completion of these buildings" (Mathews 1944:Section 1:1). To complete

buildings 5 and 9, the chief of engineers authorized the emergency hiring of additional personnel. The post engineer at Fort Harrison directed the construction until an officer arrived at Stout Field on 15 August 1942. WPA employees continued to work on the project during this period. In fact, workmen hired by the army borrowed tools from the WPA crew until they could acquire their own equipment (History of Stout Field Army Air Base 1943: Section 3:1-2). Both buildings were completed by the spring of 1943.

Building 5 was designed to house facilities for enlisted men, including locker rooms, showers, classrooms, and recreation rooms. A visiting officers' dormitory also was included in the plans. Originally, the large bay at the main entrance of Building 5 provided space for an airplane repair shop and garage (Parrish 1940). This bay was probably in-filled in the 1960s (Mark Swaim, pers. comm., 2007). The control tower on the roof of the building contained equipment for radio and field communications (Indianapolis News 1940a). Since the civilian Weir Cook Airport, which opened in 1931, was near Stout Field, pilots of military and commercial aircraft often were confused as to where to land. It was not uncommon for commercial planes to land at Stout Field and military aircraft to land at Weir Cook Airport. Relocating Stout Field's control tower from the field to the roof of Building 5 in February 1943 helped solve this problem; however, the occasional landing error still occurred. The tower also controlled the traffic light on Holt Road, east of Stout Field, to facilitate the takeoff and landing of B-25 bombers. When these aircraft were ready to take off or land the control tower stopped traffic along Holt Road (Thole 1996:94).

Since 1971, when air traffic at Stout Field ceased, Building 5 has been used as office space, although at present the building is used only for storage (Mark Swaim, pers. comm., 2007). Original exterior features of the building include the air traffic control tower, the "Administration" sign and clock over the main entrance of the primary (west) façade, and a copper light fixture on the south façade.

Building 5 – Description

The following summary is from the *Final Cultural Resources Evaluation, Historic Structures Survey and Significance Assessment State-wide Indiana Army National Guard*, prepared by BB&E, LLC, completed in July 2006.

Indianapolis Stout Field Building 5 is a simple massed plan monolithic concrete structure composed of a three-story central block surmounted by a steel and glass control tower that is flanked by two-story wings. This building is shielded by a flat roof and its profile is characterized by a stepped façade. Although the central bays of the building project forward and rise vertically to support the control tower, and vertical glass block panels are positioned above entry doors in each wing, the building's overall impact is horizontal and curvilinear. This effect is created through the use of grouped rectangular steel-frame windows, tubular steel rails on the observation platform, and incised linear spandrel motifs. Even the verticality of the building's central bays is somewhat neutralized by the use of horizontal mullions in the corner windows.

The primary curvilinear reference is in the arched masonry that enframes the fenestration of the central entrance bays. This building is distinguished by its integrity of detail, most notably the masonry winged motif and clock above the incised "ADMINISTRATION" surmounting the recessed entrance.

Building 5 was built in 1941 from designs by Indianapolis architect John P. Parrish as a National Defense Project funded by the federal New Deal WPA. Parrish also designed the nearby Stout Field Building 9, a large hangar that was built the same year. Parrish was active in Indiana through the 1920s and 1930s, designing such buildings as the Prather Masonic Lodge in Indianapolis (1921) and a number of New Deal-related projects in the mid-to-late 1930s, including the Montgomery County Alamo Gymnasium and

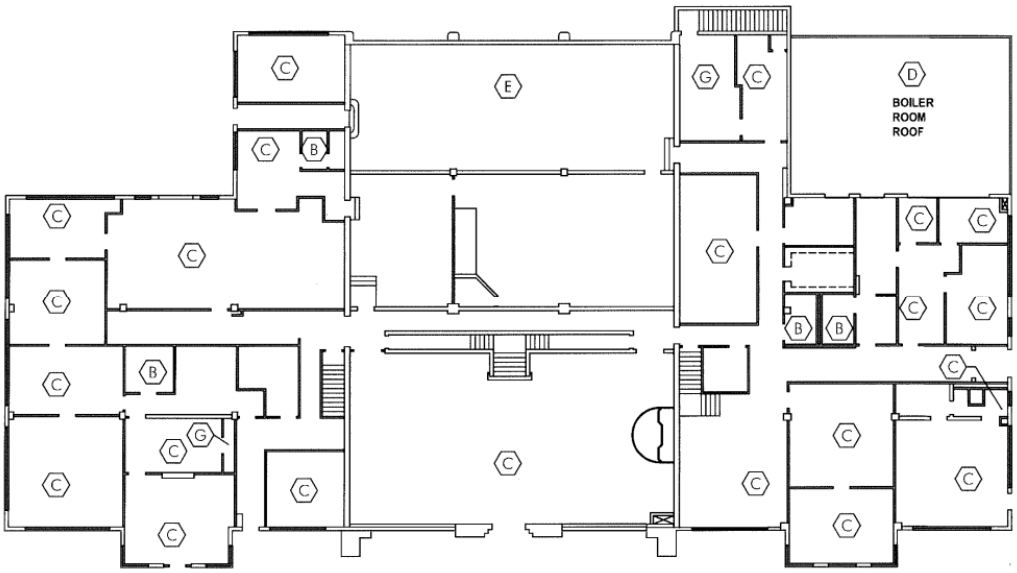
Waveland Armory buildings, as well as (with Ben H. Bacon) the Indianapolis Naval (Heslar) Armory, the Michigan City Naval Armory and, for the INARNG (in addition to Stout Field's Building 5 and Building 9) the Darlington Armory. The steel frame, glass-enclosed, air-conditioned control tower was added in 1943 to improve operations of the 1st Troop Carrier Command during its World War II administration at Stout Field.

Stout Field was one of many installations across the country that received funding from the National Defense Act in the years immediately before the United States' entry into World War II. Although not an armory, Building 5 is firmly entrenched in the INARNG Depression-era building assemblage because of its monolithic concrete construction and stylistic execution, which combines some elements reflecting the verticality and angularity of Art Deco, but shares much stronger affinities with the more curvilinear and horizontal emphasis of the Streamline Moderne.

The Administration Building and Control Tower shares with the other INARNG buildings of the period, including Stout Field Building 9/Aircraft Hangar, an association with the federal New Deal Public Works Administration (PWA) program, which encouraged use of certain architectural design elements that have been termed "PWA Moderne." This style was easily adapted into federal armory specifications and requirements by architects such as Parrish, who designed (with Ben H. Bacon) the Darlington, Michigan City, and Indianapolis North Side/Heslar armories, and Indianapolis architect Jacob Edwin Kopf who designed the other INARNG armories of this period, all of which are of monolithic concrete construction.

Building 5 appears to meet criterion C for listing in the NRHP (confirmed by INARNG Section 106 submittal, DHPA Comment dated 2/08/05) as a rare surviving, architecturally intact example of the PWA Moderne style, for representing Indiana's role in early aeronautics and more directly the importance of Stout Field in early air travel, as the product of an important Indiana architect of the period, and perhaps most importantly, as a key facility during Stout Field's World War II contribution to the war effort as headquarters for the 1st Troop Carrier Command.

BUILDING NO. 5 DIAGRAM



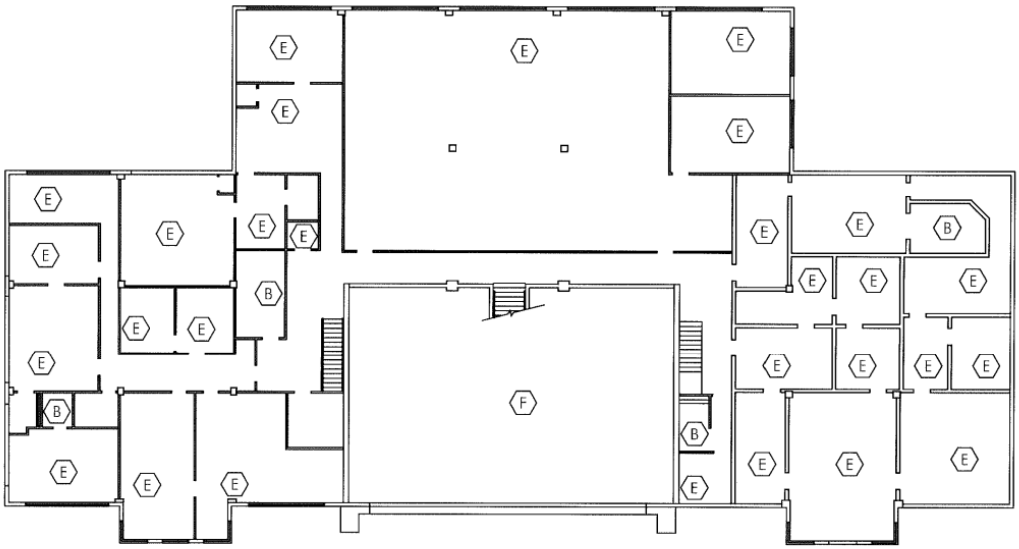
FIRST FLOOR

NORTH

LEGEND

A. OFFICE SPACE
B. TOILET ROOMS
C. STORAGE SPACE
D. ROOF AREAS
E. ORIGINAL VEHICLE BAYS
F. ORIGINAL MAINTENANCE HANGER
G. MECHANICAL

BUILDING NO. 5 DIAGRAM



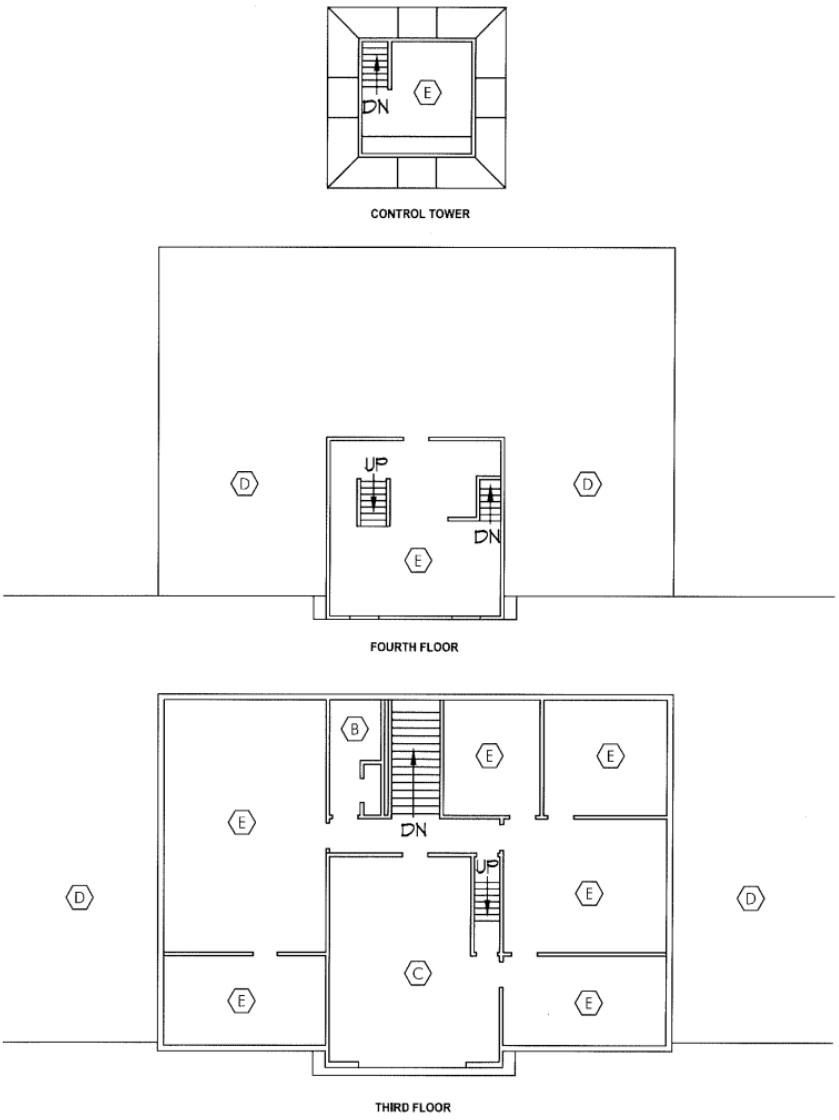
SECOND FLOOR

NORTH

LEGEND

A. OFFICE SPACE
B. TOILET ROOMS
C. MECHANICAL SPACE
D. ROOF AREAS
E. VACANT
F. ORIGINAL MAINTENANCE HANGER
G. BASEMENT BELOW

BUILDING NO. 5 DIAGRAM



LEGEND

A. OFFICE SPACE
B. TOILET ROOMS
C. STORAGE
D. ROOF AREAS
E. VACANT
F. ORIGINAL MAINTENANCE HANGER
G. MECHANICAL

APPENDIX C: LEED POINTS AND STRATEGIES

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APPENDIX C: LEED POINTS AND STRATEGIES

The following is a brief summary of the intent and basic requirements of each LEED credit as it relates or is applicable to the case study building and site. USGBC reference guide material cannot be reproduced for purposes such as this report. Much of the details and formulas have been omitted due to copyright. The following sections will give the reader a sense of the credit, but not enough information to meet the full requirements. Strategies for achieving the credit, as well as consideration for historic preservation and Antiterrorism Force Protection implications are also included for each credit. Additional LEED requirements and strategies may be required or appropriate for other renovation projects, and would need to be determined on a case-by-case basis. It is recommended to refer to the appropriate USGBC LEED program reference manual for detailed information.

SS PREREQUISITE 1: CONSTRUCTION ACTIVITY POLLUTION PREVENTION – REQUIRED

Intent

To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.

Requirements

Create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the 2003 Environmental Protection Agency (EPA) Construction General Permit OR local standards and codes, whichever is more stringent. The plan must describe the measures implemented to accomplish the following objectives:

- To prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
- To prevent sedimentation of storm sewers or receiving streams.
- To prevent pollution of the air with dust and particulate matter.

Character-defining Features and Historic Preservation

A building's character can be irreversibly damaged or changed by altering the setting around the building. The primary character-defining features of the setting for Building 5 would include the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical, and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to preserving the approach and landscaping to the front of the building.

Applicable Secretary of the Interior Standards and Preservation Briefs

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

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

Preservation Brief 17 – Architectural Character – Identifying the Visual Aspects of the Historic Buildings as an Aid to Preserving Their Character.

Antiterrorism and Force Protection Considerations

If construction activities continue once the building is occupied, obstructions within 33 feet of the occupied building must not allow for concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

Potential Technologies and Strategies

Create an erosion and sedimentation control plan during the design phase of the project. Consider employing strategies such as temporary and permanent seeding, mulching, earthen dikes, silt fencing, sediment traps, and sediment basins.

The EPA's construction general permit outlines the provisions necessary to comply with Phase I and Phase II of the National Pollutant Discharge Elimination System program. While the permit only applies to construction sites greater than 1 acre, the requirements are applied to all projects for the purposes of this prerequisite. Information on the Environmental Protection Agency construction general permit is available at http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.

SS CREDIT 1: SITE SELECTION 1 POINT

Intent

To avoid the development of inappropriate sites and reduce the environmental impact from the location of a building on a site.

Requirements

Do not develop buildings, hardscape, roads or parking areas on portions of sites that meet any of the following criteria:

- Prime farmland as defined by the U.S. Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5).
- Previously undeveloped land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by the Federal Emergency Management Agency.
- Land specifically identified as habitat for any species on federal or state threatened or endangered lists.
- Land within 100 feet of any wetlands as defined by the U.S. Code of Federal Regulations 40 CFR, Parts 230-233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, OR within setback distances from wetlands prescribed in state or local regulations, as defined by local or state rule or law, whichever is more stringent.
- Previously undeveloped land that is within 50 feet of a water body, defined as seas, lakes, rivers, streams, and tributaries that support or could support fish, recreation, or industrial use, consistent with the terminology of the Clean Water Act.
- Land that prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (park authority projects are exempt).

Character-defining Features and Historic Preservation

N/A

Applicable Department of Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

Potential Technologies and Strategies

For this project:

- Prime farmland as defined by the U.S. Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5).

- According to NRCS, Upper White Watershed (HUC – 05120201) Indiana, accessed http://www.in.nrcs.usda.gov/technical/RWA/Upper%20White/Upper%20White.pdf, this area is not prime or unique farmland.

- Previously undeveloped land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by the Federal Emergency Management Agency.

- This is not previously undeveloped land.

- Land specifically identified as habitat for any species on federal or state threatened or endangered lists.

- This land is not critical habitat for federal or state listed threatened or endangered species.

- Land within 100 feet of any wetlands as defined by the U.S. Code of Federal Regulations 40 CFR, Parts 230-233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, OR within setback distances from wetlands prescribed in state or local regulations, as defined by local or state rule or law, whichever is more stringent.

- There are no wetlands within 100 feet of the building/site.

- Previously undeveloped land that is within 50 feet of a water body, defined as seas, lakes, rivers, streams, and tributaries that support or could support fish, recreation or industrial use, consistent with the terminology of the Clean Water Act.

- This is not previously undeveloped land, nor is it within 50 feet of a sea, lake, river, stream, or tributary.

- Land that prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (park authority projects are exempt).

- This land was not recently acquired or exchanged for public parkland.

SS CREDIT 2: DEVELOPMENT DENSITY AND COMMUNITY CONNECTIVITY – 5 POINTS

Intent

To channel development to urban areas with existing infrastructure, protect greenfields, and preserve habitat and natural resources.

Requirements

OPTION 1. Development Density
Construct or renovate a building on a previously developed site AND in a community with a minimum density of 60,000 sq ft per acre net. The density calculation is based on a typical two-story downtown development and must include the area of the project being built.

OR

OPTION 2. Community Connectivity
Construct or renovate a building on a site that meets the following criteria:

- is located on a previously developed site
- is within 0.5 mile of a residential area or neighborhood with an average density of 10 units per acre net
- is within 0.5 mile of at least 10 basic services
- has pedestrian access between the building and the services

Examples of basic services include the following:

- Bank
- Place of Worship
- Convenience Grocery
- Day Care Center
- Cleaners
- Fire Station
- Beauty Salon
- Hardware
- Laundry
- Library
- Medical or Dental Office
- Senior Care Facility
- Park
- Pharmacy
- Post Office
- Restaurant
- School
- Supermarket
- Theater
- Community Center
- Fitness Center
- Museum

Proximity is determined by drawing a 0.5-mile radius around a main building entrance on a site map and counting the services within that radius.

Potential Technologies and Strategies

This project does not meet this credit.
Density is 15,089 sq ft per acre.
Not enough basic services within 0.5 mile.

SS CREDIT 3: BROWNFIELD REDEVELOPMENT 1 POINT

Intent

To rehabilitate damaged sites where development is complicated by environmental contamination and to reduce pressure on undeveloped land.

Requirements

OPTION 1
Develop on a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local voluntary cleanup program).

OR

OPTION 2
Develop on a site defined as a brownfield by a local, state, or federal government agency.

Potential Technologies and Strategies

This site has been tested and is not contaminated, nor does it meet the definition of a brownfield.

SS CREDIT 4.1: ALTERNATIVE TRANSPORTATION— PUBLIC TRANSPORTATION ACCESS 6 POINTS

Intent

To reduce pollution and land development impacts from automobile use.

Requirements

OPTION 1. Rail Station Proximity
Locate the project within 0.5-mile walking distance (measured from a main building entrance) of an existing or planned and funded commuter rail, light rail, or subway station.

This project site is not within 0.5-mile of a rail station.

OR

OPTION 2. Bus Stop Proximity
The project must be within 0.25-mile walking distance (measured from a main building entrance) of one or more stops for two or more public, campus, or private bus lines usable by building occupants.

Potential Technologies and Strategies

This project site is not within 0.25-mile of one or more stops for two or more bus lines.

SS CREDIT 4.2: ALTERNATIVE TRANSPORTATION— BICYCLE STORAGE AND CHANGING ROOMS 1 POINT

Intent

To reduce pollution and land development impacts from automobile use.

Requirements

CASE 1. Commercial or Institutional Projects
Provide secure bicycle racks and/or storage within 200 yards of a building entrance for 5% or more of all building users (measured at peak periods).

Provide shower and changing facilities in the building, or within 200 yards of a building entrance, for 0.5% of FTE occupants.

Potential Technologies and Strategies

Assumption:
FTE 250 x 0.5% = 125 x .05 bike spaces = 10 bike racks
FTE 250 x 0.5% = 125 x .005 showers = 1 shower

Include transportation amenities such as bicycle racks and shower/changing facilities.

Indoor storage space could be used instead of bike racks. Communal bikes could be purchased and use for commuting between Stout Field buildings.

Character-defining Features and Historic Preservation

There were three shower rooms and a locker room on the first floor in the original floor plan. In addition, two shower rooms which still contain the original glazed tile (a character defining feature) were located on the second floor. There is original floor tile in some shower and restrooms.

There are some original bathroom fixtures, i.e., toilets and urinals (character-defining features), although reuse may be difficult.

Applicable Department of Interior Preservation Briefs

Preservation Brief 18 - Rehabilitating Interiors in Historic Buildings Identifying and Preserving Character-Defining Elements
Preservation Brief 40 - Preserving Historic Ceramic Tile Floors

Antiterrorism and Force Protection Considerations

Bike rack design must not constitute an obstruction (within 33 ft of the occupied building) that allows for concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

SS CREDIT 4.3: ALTERNATIVE TRANSPORTATION— LOW-EMITTING AND FUEL-EFFICIENT VEHICLES 3 POINTS

Intent

To reduce pollution and land development impacts from automobile use.

Requirements

OPTION 1
Provide preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site.

OR

OPTION 2
Install alternative fuel fueling stations for 3% of the total vehicle parking capacity of the site. Liquid or gaseous fueling facilities must be separately ventilated or located outdoors.

OR

OPTION 3
Provide low-emitting and fuel efficient vehicles for 3% of FTE occupants.
Provide preferred parking for these vehicles.

OR

OPTION 4
Provide building occupants access to a low-emitting or fuel efficient vehicle-sharing program. The following requirements must be met:

- One low-emitting or fuel efficient vehicle must be provided per 3% of FTE occupants, assuming that one shared vehicle can carry eight persons (i.e., 1 vehicle per 267 FTE occupants).
- For buildings with fewer than 267 FTE occupants, at least one low-emitting or fuel efficient vehicle must be provided.
- A vehicle-sharing contract must be provided that has an agreement of at least two years.

Character-defining Features and Historic Preservation

A building's character can be irreversibly damaged or changed by altering the setting around the building. The primary character-defining features of the setting for Building 5 would include the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical, and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 36 – Protecting Cultural Landscapes: Planning, Treatment, and Management of Historic Landscapes

Preservation Brief 47 – Maintaining the Exteriors of Small and Medium-size Historic Buildings

Antiterrorism and Force Protection Considerations

ATFP standards (B-1.1.2.2.1.2 Parking Without a Controlled Perimeter) require no parking within 82 ft (25 meters) of the building. Emergency, command, and operations support vehicles may be parked up to 33 ft (10 meters) from the building (B-1.1.3, B-1.2).

Potential Technologies and Strategies

For the purposes of this credit, low-emitting and fuel efficient vehicles are defined as vehicles that are either classified as Zero Emission Vehicles by the California Air Resources Board or have achieved a minimum green score of 40 on the American Council for an Energy Efficient Economy annual vehicle rating guide.

The estimated number of customers served per vehicle must be supported by documentation.

Locate parking for low-emitting and fuel efficient vehicles in the nearest available spaces in the nearest available parking area.

Provide transportation amenities such as alternative fuel refueling stations. Consider sharing the costs and benefits of refueling stations with other buildings.

SS CREDIT 4.4: ALTERNATIVE TRANSPORTATION—PARKING CAPACITY 2 POINTS

Intent

To reduce pollution and land development impacts from automobile use.

Requirements

CASE 1. Nonresidential Projects

OPTION 3
Provide no new parking.

Character-defining Features and Historic Preservation

A building's character can be irreversibly damaged or changed by altering the setting around the building. The primary character-defining features of the setting for Building 5 would include the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical, and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of Interior Preservation Briefs

Preservation Brief 36 – Protecting Cultural Landscapes: Planning, Treatment, and Management of Historic Landscapes

Preservation Brief 47 – Maintaining the Exteriors of Small and Medium-size Historic Buildings

Antiterrorism and Force Protection Considerations

ATFP standards (B-1.1.2.2.1.2 Parking Without a Controlled Perimeter) require no parking within 82 ft (25 meters) of the building. Emergency, command, and operations support vehicles may be parked up to 33 ft (10 meters) from the building (B-1.1.3, B-1.2).

When the main entrance of a building faces the perimeter, as in Building 5, the antiterrorism standards suggest one of two options. Either use a different entrance as the main entrance or screen the main entrance to limit the ability of potential aggressors to target people entering and leaving the building.

Potential Technologies and Strategies

No additional parking is required for this project.

SS CREDIT 5.1: SITE DEVELOPMENT— PROTECT OR RESTORE HABITAT 1 POINT

Intent

To conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

Requirements

CASE 2. Previously Developed Areas or Graded Sites
Restore or protect a minimum of 50% of the site (excluding the building footprint) or 20% of the total site area (including building footprint), whichever is greater, with native or adapted vegetation.

Character-defining Features and Historic Preservation

A building's character can be irreversibly damaged or changed by altering the setting around the building. The primary character-defining features of the setting for Building 5 would include the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of Interior Preservation Briefs

Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment, and Management of Historic Landscapes

Antiterrorism and Force Protection Considerations

Plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

Potential Technologies and Strategies

Project earning SS Credit 2: Development Density and Community Connectivity may include vegetated roof surface in this calculation if the plants are native or adapted, provide habitat, and promote biodiversity. However, the roof space is not necessary for this project to achieve this credit.

The project area is 2.0 acres
The existing green space is 0.9 acre
The building footprint is 0.32 acre

2.0 acres – 0.32 acres (building footprint) = 1.68 acres. 50% = 0.84 acres
20% of total site is 0.4 acre

Native or adapted plants are plants indigenous to a locality or cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds.

For previously developed sites, use local and regional governmental agencies, consultants, educational facilities, and native plant societies as resources for the selection of appropriate native or adapted plants. Prohibit plants listed as invasive or noxious weed species. Once established, native/adapted plants require minimal or no irrigation; do not require active maintenance such as mowing or chemical inputs such as fertilizers, pesticides, or herbicides; and provide habitat value and promote biodiversity through avoidance of monoculture plantings.

SS CREDIT 5.2: SITE DEVELOPMENT— MAXIMIZE OPEN SPACE 1 POINT

Intent

To promote biodiversity by providing a high ratio of open space to development footprint.

Requirements

CASE 2. Sites with No Local Zoning Requirements (e.g., some university campuses, military bases)
Provide a vegetated open space area adjacent to the building that is equal in area to the building footprint.

Character-defining Features and Historic Preservation

A building's character can be irreversibly damaged or changed by altering the setting around the building. The primary character-defining features of the setting for Building 5 would include the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical, and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of Interior Preservation Briefs

Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment, and Management of Historic Landscapes.

Antiterrorism and Force Protection Considerations

Plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows for concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

Potential Technologies and Strategies

The project area is 2.0 acres.
The existing green space is 0.9 acre.
The building footprint is 0.32 acre.

SS CREDIT 6.1: STORMWATER DESIGN— QUANTITY CONTROL 1 POINT

Intent

To limit disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution from stormwater runoff and eliminating contaminants.

Requirements

CASE 1. Sites with Existing Imperviousness 50% or less.

OPTION 1
Implement a stormwater management plan that prevents the post development peak discharge rate and quantity from exceeding the predevelopment peak discharge rate and quantity for the one- and two-year, 24-hour design storms.

OR

OPTION 2
Implement a stormwater management plan that protects receiving stream channels from excessive erosion. The stormwater management plan must include stream channel protection and quantity control strategies.

CASE 2. Sites with Existing Imperviousness Greater Than 50%
Implement a stormwater management plan that results in a 25% decrease in the volume of stormwater runoff from the two-year, 24-hour design storm.

Character-defining Features and Historic Preservation

A building's character can be irreversibly damaged or changed by altering the setting around the building. The primary character-defining features of the setting for Building 5 would include the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical, and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of Interior Preservation Briefs

Preservation Brief 1: Assessing Cleaning and Water-Repellent Treatments for Historic Buildings
Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors
Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes
Preservation Brief 39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings

Antiterrorism and Force Protection Considerations

Plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

AT/FP standards (B-1.1.2.2.1.2 Parking Without a Controlled Perimeter) require no parking within 82 ft (25 meters) of the building. Emergency, command, and operations support vehicles may be parked up to 33 ft (10 meters) from the building (B-1.1.3, B-1.2).

Potential Technologies and Strategies

Design the project site to maintain natural stormwater flows by promoting infiltration. Specify vegetated roofs, pervious paving, and other measures to minimize impervious surfaces. Reuse stormwater for nonpotable uses such as landscape irrigation, toilet and urinal flushing, and custodial uses.

SS CREDIT 6.2: STORMWATER DESIGN— QUALITY CONTROL 1 POINT

Intent

To limit disruption and pollution of natural water flows by managing stormwater runoff.

Requirements

Implement a stormwater management plan that reduces impervious cover, promotes infiltration, and captures and treats the stormwater runoff from 90% of the average annual rainfall1 using acceptable best management practices (BMPs).

BMPs used to treat runoff must be capable of removing 80% of the average annual post-development total suspended solids load based on existing monitoring reports. BMPs are considered to meet these criteria if:

- They are designed in accordance with standards and specifications from a state or local program that has adopted these performance standards.

OR

- There exists infield performance monitoring data demonstrating compliance with the criteria. Data must conform to accepted protocol (e.g., Technology Acceptance Reciprocity Partnership, Washington State Department of Ecology) for BMP monitoring.

Character-defining Features and Historic Preservation

The control tower and flat nature of the roof are considered character-defining features of Building 5. This includes the downspouts and gutter system.

Another character-defining feature of Building 5 is the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical, and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of Interior Preservation Briefs

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Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment, and Management of Historic Landscapes
Preservation Brief 39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings

Antiterrorism and Force Protection Considerations

Plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

ATFP standards (B-1.1.2.2.1.2 Parking Without a Controlled Perimeter) require no parking within 82 ft (25 meters) of the building. Emergency, command, and operations support vehicles may be parked up to 33 ft (10 meters) from the building (B-1.1.3, B-1.2).

Access to the roof must be controlled. In existing buildings, this means eliminating external access where possible and securing external ladders or stairways with locked cages or similar devices (B-3.5.2).

Potential Technologies and Strategies

Use alternative surfaces (e.g., vegetated roofs, pervious pavement, grid pavers) and nonstructural techniques (e.g., rain gardens, vegetated swales, disconnection of imperviousness, rainwater recycling) to reduce imperviousness and promote infiltration and thereby reduce pollutant loadings. Use sustainable design strategies (e.g., low-impact development, environmentally sensitive design) to create integrated natural and mechanical treatment systems such as constructed wetlands, vegetated filters, and open channels to treat stormwater runoff.

There are three distinct climates in the United States that influence the nature and amount of annual rainfall. Humid watersheds are defined as those that receive at least 40 inches of rainfall each year. Semiarid watersheds receive between 20 and 40 inches of rainfall per year, and arid watersheds receive less than 20 inches of rainfall per year. For this credit, 90% of the average annual rainfall is equivalent to treating the runoff from the following (based on climate):

SS CREDIT 7.1: HEAT ISLAND EFFECT—NONROOF 1 POINT

Intent

To reduce heat islands: to minimize impacts on microclimates and human and wildlife habitats.

Requirements

OPTION 1
Use any combination of the following strategies for 50% of the site hardscape (including roads, sidewalks, courtyards, and parking lots):

- Provide shade from the existing tree canopy or within five years of landscape installation. Landscaping (trees) must be in place at the time of occupancy.
- Provide shade from structures covered by solar panels that produce energy used to offset some nonrenewable resource use.
- Provide shade from architectural devices or structures that have a solar reflectance index (SRI) of at least 29.
- Use hardscape materials with an SRI of at least 29.
- Use an open-grid pavement system (at least 50% pervious).

OR

OPTION 2
Place a minimum of 50% of parking spaces under cover. Any roof used to shade or cover parking must have an SRI of at least 29, be a vegetated green roof, or be covered by solar panels that produce energy used to offset some nonrenewable resource use.

Character-defining Features and Historic Preservation

The control tower and flat nature of the roof are considered character-defining features of Building 5. This includes the downspouts and gutter system.

Another character-defining feature of Building 5 is the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical, and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors
Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment, and Management of Historic Landscapes

Antiterrorism and Force Protection Considerations

Plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

ATFP standards (B-1.1.2.2.1.2 Parking Without a Controlled Perimeter) require no parking within 82 ft (25 meters) of the building. Emergency, command, and operations support vehicles may be parked up to 33 ft (10 meters) from the building (B-1.1.3, B-1.2).

Potential Technologies and Strategies

Employ strategies, materials, and landscaping techniques that reduce the heat absorption of exterior materials. Use shade (calculated on 21 June, noon solar time) from native or adapted trees and large shrubs, vegetated trellises, or other exterior structures supporting vegetation. Consider using new coatings and integral colorants for asphalt to achieve light-colored surfaces instead of blacktop. Position photovoltaic cells to shade impervious surfaces.

Consider replacing constructed surfaces (e.g., roof, roads, sidewalks, etc.) with vegetated surfaces such as vegetated roofs and open-grid paving or specify high-albedo materials such as concrete to reduce heat absorption.

Heat islands are defined as thermal gradient differences between developed and undeveloped areas.

The SRI is a measure of the constructed surface's ability to reflect solar heat as shown by a small temperature rise. It is defined so that a standard black surface (reflectance 0.05, emittance 0.90) is 0 and a standard white surface (reflectance 0.80, emittance 0.90) is 100.

For the purposes of this credit, covered parking is defined as parking underground, under deck, under roof, or under a building.

SS CREDIT 7.2: HEAT ISLAND EFFECT—ROOF 1 POINT

Intent

To reduce heat islands to minimize impacts on microclimates and human and wildlife habitats.

Requirements

OPTION 1
Use roofing materials with a SRI equal to or greater than the values in the table below for a minimum of 75% of the roof surface.

Roof Type	Slope	SRI
Low-slope roof	≤2:12	78
Steep-slope roof	>2:12	29

OR

OPTION 2
Install a vegetated roof that covers at least 50% of the roof area.

OR

OPTION 3
Install high-albedo and vegetated roof surfaces that, in combination, meet the following criteria:

$$\frac{\text{Area Roof Meeting Minimum SRI}}{0.75} \times \frac{\text{Area of vegetated roof}}{0.5} \geq \text{Total Roof Area}$$

Character-defining Features and Historic Preservation

The control tower and flat nature of the roof are considered character-defining features of Building 5. This includes the downspouts and gutter system.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors
Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes

Antiterrorism and Force Protection Considerations

Access to the roof must be controlled. In existing buildings, this means eliminating external access where possible and securing external ladders or stairways with locked cages or similar devices (B-3.5.2).

Potential Technologies and Strategies

Heat islands are defined as thermal gradient differences between developed and undeveloped areas.

The SRI is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black surface (reflectance 0.05, emittance 0.90) is 0 and a standard white surface (reflectance 0.80, emittance 0.90) is 100.

Consider installing high-albedo and vegetated roofs to reduce heat absorption. Default values will be available in the *LEED Reference Guide for Green Building Design and Construction*, 2009 Edition. Product information is available from the Cool Roof Rating Council Web site at http://www.coolroofs.org/ and the ENERGY STAR® Web site at http://www.energystar.gov/.

SS CREDIT 8: LIGHT POLLUTION REDUCTION 1 POINT

Intent

To minimize light trespass from the building and site, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction and reduce development impact from lighting on nocturnal environments.

Requirements

Project teams must comply with one of the two options for interior lighting AND the requirement for exterior lighting.

For Interior Lighting:

OPTION 1
Reduce the input power (by automatic device of) all nonemergency interior luminaires with a direct line of sight to any openings in the envelope (translucent or transparent) by at least 50% between 11:00 p.m. and 5:00 a.m.

After-hours override may be provided by a manual or occupant-sensing device provided the override lasts no more than 30 minutes.

OR

OPTION 2
All openings in the envelope (translucent or transparent) with a direct line of sight to any nonemergency luminaires must have shielding (controlled/closed by automatic device for a resultant transmittance of less than 10% between 11:00 p.m. and 5:00 a.m.).

For Exterior Lighting:

Light areas only as required for safety and comfort. Lighting power densities must not exceed ANSI/ASHRAE/IESNA Standard 90.1-2007 for the classified zone, and must meet exterior lighting control requirements from ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda). Exterior Lighting Section, without amendments.

LZ3: Medium (all other areas not included in LZ1, LZ2 or LZ4, such as commercial/ industrial, and high-density residential)

Design exterior lighting so that all site and building-mounted luminaires produce a maximum initial illuminance value no greater than 0.20 horizontal and vertical footcandles at the site boundary and no greater than 0.01 horizontal footcandles 15 feet beyond the site. Document that no more than 5% of the total initial designed fixture lumens (sum total of all fixtures on-site) are emitted at an angle of 90 degrees or higher from nadir (straight down).

LZ2, LZ3 and LZ4 - For site boundaries that abut public rights-of-way, light trespass requirements may be met relative to the curb line instead of the site boundary.

For All Zones

Illuminance generated from a single luminaire placed at the intersection of a private vehicular driveway and public roadway accessing the site is allowed to use the centerline of the public roadway as the site boundary for a length of two times the driveway width centered at the centerline of the driveway.

Character-defining Features and Historic Preservation

The only character-defining electrical feature of Building 5 is the original floodlight on the parapet. This should be preserved.

Applicable Department of Interior Preservation Briefs

Preservation Brief 3: Conserving Energy in Historic Buildings
Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements
Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes
Preservation Brief 47: Maintaining the Exterior of Small and Medium Size Historic Buildings

Antiterrorism and Force Protection Considerations

N/A

Potential Technologies and Strategies

Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution. Minimize site lighting where possible. Technologies to reduce light pollution include full cutoff luminaires, low-reflectance surfaces, and low-angle spotlights.

WE PREREQUISITE 1: WATER USE REDUCTION REQUIRED

Intent

To increase water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Requirements

Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation).

Calculations are based on estimated occupant usage and must include only the following fixtures and fixture fittings (as applicable to the project scope): water closets, urinals, lavatory faucets, showers, kitchen sink faucets, and pre-rinse spray valves.

Commercial Fixtures, Fittings, Appliance	Current Baseline
Commercial toilets	1.6 gallons per flush (gpf)* Except blow out fixtures: 3.5 gpf
Commercial urinals	1.0 gpf
Commercial lavatory (restroom) faucets	2.2 gallons per minute (gpm) at 60 pounds per square inch (psi), private application only (hotel/motel guest room, hospital patient room) 0.5 gpm at 60 psi ** all others except private 0.25 gallons per cycle for metering faucets
Commercial pre-rinse spray valves (for food service)	Flow rate ≤ 1.6 gpm (no pressure specified, no performance requirements)

Residential fixtures, fittings, and appliances	Current baseline
Residential toilets	1.6 gpf ***
Residential lavatory (bathroom) fixtures	2.2 gpm at 60 psi
Residential kitchen faucet	
Residential shower heads	2.5 gpm at 80 psi per shower stall ****

* EPAct 1992 standard for toilets applies to both commercial and residential models.
** In addition to EPAct requirements, the American Society of Mechanical Engineers standard for public lavatory faucets is 0.5 gpm at 60 psi (ASME A112.18.1-2005). This maximum has been incorporated into the National Uniform Plumbing Code and the International Plumbing Code.
*** EPAct 1992 standard for toilets applies to both commercial and residential models.
**** Residential shower compartment (stall) in dwelling units: The total allowable flow rate from all flowing showerheads at any given time, including rain systems, waterfalls, body-sprays, body-spas and jets, must be limited to the allowable showerhead flow rate as specified above (2.5 gpm) per shower compartment, where the floor area of the shower compartment is less than 2,500 square inches. For each increment of 2,500 square inches of floor area thereafter or part thereof, an additional showerhead with total allowable flow rate from all flowing devices equal to or less than the allowable flow rate as specified above must be allowed. Exception: Showers that emit recirculated nonpotable water originating from within the shower compartment while operating are allowed to exceed the maximum as long as the total potable water flow does not exceed the flow rate as specified above.

Note: Tables adapted from information developed and summarized by the EPA Office of Water based on requirements of the Energy Policy Act (EPAct) of 1992 and subsequent rulings by the Department of Energy, requirements of the EPAct of 2005, and the plumbing code requirements as stated in the 2006 editions of the Uniform Plumbing Code or International Plumbing Code pertaining to fixture performance.

The following fixtures, fittings, and appliances are outside the scope of the water use reduction calculation:

- commercial steam cookers
- commercial dishwashers
- automatic commercial ice makers
- commercial (family-sized) clothes washers
- residential clothes washers
- standard and compact residential dishwashers

Character-defining Features and Historic Preservation

The floor-mounted plumbing features are considered a character-defining feature of Building 5. The hexagonal porcelain tile lining some of the bathroom floors is also original and a character-defining feature. Glazed terra-cotta tiles along the bathroom walls, also original, are considered a character-defining feature and should be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 3: Conserving Energy in Historic Buildings
Preservation Brief 7: The Preservation of Historic Glazed Architectural Terra-Cotta
Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements
Preservation Brief 40: Preserving Historic Ceramic Tile Floors

Antiterrorism and Force Protection Considerations

To prevent waterborne contamination tactics, access to the potable water supply and distribution system should be controlled. Greater protection measures, such as intrusion-detection systems and alternate water sources are described in Chapter 4 of UFC 4-020-01, if deemed necessary (UFC 4-020-01, Chapter 4-7).

Potential Technologies and Strategies

WaterSense-certified fixtures and fixture fittings should be used where available. Use high-efficiency fixtures (e.g., water closets and urinals) and dry fixtures, such as toilets attached to composting systems, to reduce potable water demand. Consider using alternative on-site sources of water (e.g., rainwater, stormwater, and air-conditioner condensate) and gray water for nonpotable applications such as custodial uses and toilet and urinal flushing. The quality of any alternative source of water used must be taken into consideration based on its application or use.

WE CREDIT 1: WATER EFFICIENT LANDSCAPING 2–4 POINTS

Intent

To limit or eliminate the use of potable water or other natural surface or subsurface water resources available on or near the project site for landscape irrigation.

Requirements

OPTION 1. Reduce by 50% (2 points)
Reduce potable water consumption for irrigation by 50% from a calculated midsummer baseline case. Reductions must be attributed to any combination of the following items:

- plant species, density and microclimate factor
- irrigation efficiency
- use of captured rainwater
- use of recycled wastewater
- use of water treated and conveyed by a public agency specifically for nonpotable uses

Groundwater seepage that is pumped away from the immediate vicinity of building slabs and foundations may be used for landscape irrigation to meet the intent of this credit. However, the project team must demonstrate that doing so does not affect site stormwater management systems.

OR

OPTION 2. No Potable Water Use or Irrigation (4 points)

Meet the requirements for Option 1.

AND

PAT H 1
Use only captured rainwater, recycled wastewater, recycled gray water, or water treated and conveyed by a public agency specifically for nonpotable uses for irrigation.

OR

PAT H 2
Install landscaping that does not require permanent irrigation systems. Temporary irrigation systems used for plant establishment are allowed only if removed within one year of installation.

If the percent reduction of potable water is 100% AND the percent reduction of total water is equal to or greater than 50%, both Option 1 and Option 2 are earned.

Character-defining Features and Historic Preservation

A building's character can be irreversibly damaged or changed by altering the setting around the building. The primary character-defining features of the setting for Building 5 would include the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment, and Management of Historic Landscapes
Preservation Brief 47: Maintaining the Exteriors of Small and Medium-size Historic Buildings

Antiterrorism and Force Protection Considerations

Exterior plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

Potential Technologies and Strategies

Perform a soil/climate analysis to determine appropriate plant material and design the landscape with native or adapted plants to reduce or eliminate irrigation requirements. Where irrigation is required, use high-efficiency equipment and/or climate-based controllers.

There is currently regular irrigation at Stout Field.

WE CREDIT 2: INNOVATIVE WASTEWATER TECHNOLOGIES 2 POINTS

Intent

To reduce wastewater generation and potable water demand while increasing the local aquifer recharge.

Requirements

OPTION 1
Reduce potable water use for building sewage conveyance by 50% through the use of water-conserving fixtures (e.g., water closets, urinals) or nonpotable water (e.g., captured rainwater, recycled gray water, on-site or municipally treated wastewater).

OR

OPTION 2
Treat 50% of wastewater on-site to tertiary standards. Treated water must be infiltrated or used on-site.

Character-defining Features and Historic Preservation

The floor-mounted plumbing features are considered a character-defining feature of Building 5. The hexagonal porcelain tile lining some of the bathroom floors is also original and a character-defining feature. Glazed terra-cotta tiles along the bathroom walls, also original, are considered a character-defining feature and should be preserved.

The control tower and flat nature of the roof are considered character-defining features of Building 5. This includes the downspouts and gutter system.

Another character-defining feature of Building 5 is the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical, and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 7: The Preservation of Historic Glazed Architectural Terra-Cotta
Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements
Preservation Brief 36: Protecting Cultural Landscapes: Planning, Treatment, and Management of Historic Landscapes
Preservation Brief 40: Preserving Historic Ceramic Tile Floors
Preservation Brief 47: Maintaining the Exteriors of Small and Medium-size Historic Buildings

Antiterrorism and Force Protection Considerations

Exterior plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows for concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

To prevent waterborne contamination tactics, access to the potable water supply and distribution system should be controlled. Greater protection measures, such as intrusion-detection systems and alternate water sources are described in Chapter 4 of UFC 4-020-01, if deemed necessary (UFC 4-020-01, Chapter 4-7).

Potential Technologies and Strategies

Specify high efficiency fixtures and dry fixtures (e.g., composting toilet systems, nonwater-using urinals) to reduce wastewater volumes. Consider reusing stormwater or gray water for sewage conveyance or on-site mechanical and/ or natural wastewater treatment systems. Options for on-site wastewater treatment include packaged biological nutrient removal systems, constructed wetlands, and high efficiency filtration systems.

Note: Should check with the state regarding any restrictions on harvesting rainwater.

WE CREDIT 3: WATER USE REDUCTION 2–4 POINTS

Intent

To further increase water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Requirements

Employ strategies that in aggregate use less water than the water-use baseline calculated for the building (not including irrigation). The minimum water savings percentage for each point threshold is as follows:

Percentage Reduction	Points
30%	2
35%	3
40%	4

Calculate the baseline according to the commercial and/or residential baselines outlined below. Calculations are based on estimated occupant usage and must include only the following fixtures and fixture fittings (as applicable to the project scope): water closets, urinals, lavatory faucets, showers, kitchen sink faucets, and pre-rinse spray valves.

Commercial Fixtures, Fittings, Appliance	Current Baseline
Commercial toilets	1.6 gallons per flush (gpf)* Except blow out fixtures: 3.5 gpf
Commercial urinals	1.0 gpf
Commercial lavatory (restroom) faucets	2.2 gallons per minute (gpm) at 60 pounds per square inch (psi), private application only (hotel/motel guest room, hospital patient room) 0.5 gpm at 60 psi ** all others except private 0.25 gallons per cycle for metering faucets
Commercial pre-rinse spray valves (for food service)	Flow rate ≤ 1.6 gpm (no pressure specified, no performance requirements)

Residential fixtures, fittings, and appliances	Current baseline
Residential toilets	1.6 gpf ***
Residential lavatory (bathroom) fixtures	2.2 gpm at 60 psi
Residential kitchen faucet	
Residential shower heads	2.5 gpm at 80 psi per shower stall ****

* EPAct 1992 standard for toilets applies to both commercial and residential models.
** In addition to EPAct requirements, the American Society of Mechanical Engineers standard for public lavatory faucets is 0.5 gpm at 60 psi (ASME A112.18.1-2005). This maximum has been incorporated into the national Uniform Plumbing Code and the International Plumbing Code.
*** EPAct 1992 standard for toilets applies to both commercial and residential models.
**** Residential shower compartment (stall) in dwelling units: The total allowable flow rate from all flowing showerheads at any given time, including rain systems, waterfalls, body-sprays, body-spas and jets, must be limited to the allowable showerhead flow rate as specified above (2.5 gpm) per shower compartment, where the floor area of the shower compartment is less than 2,500 square inches. For each increment of 2,500 square inches of floor area thereafter or part thereof, an additional showerhead with total allowable flow rate from all flowing devices equal to or less than the allowable flow rate as specified above must be allowed. Exception: Showers that emit recirculated nonpotable water originating from within the shower compartment while operating are allowed to exceed the maximum as long as the total potable water flow does not exceed the flow rate as specified above.

Note: Tables adapted from information developed and summarized by the EPA Office of Water based on requirements of the Energy Policy Act (EPAct) of 1992 and subsequent rulings by the Department of Energy, requirements of the EPAct of 2005, and the plumbing code requirements as stated in the 2006 editions of the Uniform Plumbing Code or International Plumbing Code pertaining to fixture performance.

The following fixtures, fittings, and appliances are outside the scope of the water-use reduction calculation:

- commercial steam cookers
- commercial dishwashers
- automatic commercial ice makers
- commercial (family-sized) clothes washers
- residential clothes washers
- standard and compact residential dishwashers

Character-defining Features and Historic Preservation

The floor-mounted plumbing features are considered a character-defining feature of Building 5. The hexagonal porcelain tile lining some of the bathroom floors is also original and a character-defining feature. Glazed terra-cotta tiles along the bathroom walls, also original, are considered a character-defining feature and should be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 7: The Preservation of Historic Glazed Architectural Terra-Cotta
Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements
Preservation Brief 40: Preserving Historic Ceramic Tile Floors

Antiterrorism and Force Protection Considerations

Exterior plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows for concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

To prevent waterborne contamination tactics, access to the potable water supply and distribution system should be controlled. Greater protection measures, such as intrusion-detection systems and alternate water sources are described in Chapter 4 of UFC 4-020-01, if deemed necessary (UFC 4-020-01, Chapter 4-7).

Potential Technologies and Strategies

Use WaterSense-certified fixtures and fixture fittings where available. Use high-efficiency fixtures (e.g., water closets and urinals) and dry fixtures, such as toilets attached to composting systems, to reduce the potable water demand.

Consider using alternative on-site sources of water (e.g., rainwater, stormwater, and air-conditioner condensate, gray water) for nonpotable applications (e.g., toilet and urinal flushing, custodial uses). The quality of any alternative source of water being used must be taken into consideration based on its application or use.

EA PREREQUISITE 1: FUNDAMENTAL COMMISSIONING OF BUILDING ENERGY SYSTEMS — REQUIRED

Intent

To verify that the project's energy-related systems are installed and calibrated to perform according to the owner's project requirements, basis of design, and construction documents. Benefits of commissioning include reduced energy use, lower operating costs, fewer contractor callbacks, better building documentation, improved occupant productivity, and verification that the systems perform in accordance with the owner's project requirements.

Requirements

The following commissioning process activities must be completed by the project team:

- Designate an individual as the commissioning authority (CxA) to lead, review, and oversee the completion of the commissioning process activities.
  - The CxA must have documented commissioning authority experience in at least two building projects.
  - The individual serving as the CxA must be independent of the project design and construction management, though the CxA may be an employee of any firm providing those services. The CxA may be a qualified employee or consultant of the owner.
  - The CxA must report results, findings and recommendations directly to the owner.
  - For projects smaller than 50,000 gross sq ft, the CxA may be a qualified person on the design or construction team who has the required experience.
- The owner must document the owner's project requirements. The design team must develop the basis of design. The CxA must review these documents for clarity and completeness. The owner and design team must be responsible for updates to their respective documents.
- Develop and incorporate commissioning requirements into the construction documents.
- Develop and implement a commissioning plan.
- Verify the installation and performance of the systems to be commissioned.
- Complete a summary commissioning report.

Commissioned Systems

Commissioning process activities must be completed for the following energy-related systems, at a minimum:

- HVAC and refrigeration systems (mechanical and passive) and associated controls
- lighting and daylighting controls
- domestic hot water systems
- renewable energy systems (e.g., wind, solar)

Potential Technologies and Strategies

Engage a CxA as early as possible in the design process. Determine the owner's project requirements, develop and maintain a commissioning plan for use during design and construction and incorporate

commissioning requirements in bid documents. Assemble the commissioning team, and prior to occupancy verify the performance of energy consuming systems. Complete the commissioning reports with recommendations prior to accepting the commissioned systems.

Qualified individuals are identified as those who possess a high level of experience in the following areas:

- energy systems design, installation, and operation
- commissioning planning and process management
- hands-on field experience with energy systems performance, interaction, start-up, balancing, testing, troubleshooting, operation, and maintenance procedures
- energy systems automation control knowledge

Owners are encouraged to consider including water-using systems, building envelope systems, and other systems in the scope of the commissioning plan, as appropriate. The building envelope is an important component of a facility that impacts energy consumption, occupant comfort, and indoor air quality. While this prerequisite does not require building envelope commissioning, an owner can achieve significant financial savings and reduce risk of poor indoor air quality by including it in the commissioning process.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

Ensure that the emergency shutoff switch for the HVAC control system is in place and working properly (B-4.3).

EA PREREQUISITE 2: MINIMUM ENERGY PERFORMANCE REQUIRED

Intent

To establish the minimum level of energy efficiency for the proposed building and systems to reduce environmental and economic impacts associated with excessive energy use.

Requirements

OPTION 1. Whole Building Energy Simulation

Demonstrate a 10% improvement in the proposed building performance rating for new buildings, or a 5% improvement in the proposed building performance rating for major renovations to existing buildings compared with the baseline building performance rating.

Calculate the baseline building performance rating according to the building performance rating method in appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) using a computer simulation model for the whole building project. To achieve points using this credit, the proposed design must meet the following criteria:

- Comply with the mandatory provisions in Standard 90.1-2007 (with errata but without addenda).
- Include all energy costs associated with the building project.
- Compare against a baseline building that complies with appendix G of Standard 90.1-2007 (with errata but without addenda1). The default process energy cost is 25% of the total energy cost for the baseline building. If the building's process energy cost is less than 25% of the baseline building energy cost, the LEED submittal must include documentation substantiating that process energy inputs are appropriate.

For the purpose of this analysis, process energy is considered to include, but is not limited to, office and general miscellaneous equipment, computers, elevators and escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g., lighting integral to medical equipment), and other (e.g., waterfall pumps).

Regulated (nonprocess) energy includes lighting (for the interior, parking garage, surface parking, façade, or building grounds, etc., except as noted above), HVAC (for space heating, space cooling, fans, pumps, toilet exhaust, parking garage ventilation, kitchen hood exhaust, etc.), and service water heating for domestic or space heating purposes.

OR

OPTION 3. Prescriptive Compliance Path: Advanced Buildings™ Core Performance™ Guide
Comply with the prescriptive measures identified in the Advanced Buildings™ Core Performance™ Guide developed by the New Buildings Institute.

The building must meet the following requirements:

- less than 100,000 sq ft
- comply with Section 1: Design Process Strategies, and Section 2: Core Performance Requirements

- office, school, public assembly, and retail projects less than 100,000 sq ft must comply with Section 1and Section 2 of the Core Performance Guide
- other project types less than 100,000 sq ft implement the basic requirements of the Core Performance Guide
- healthcare, warehouse, and laboratory projects are ineligible for this path

Potential Technologies and Strategies

Design the building envelope and systems to meet baseline requirements. Use a computer simulation model to assess the energy performance and identify the most cost-effective energy efficiency measures. Quantify energy performance compared with a baseline building.

If local code has demonstrated quantitative and textual equivalence following, at a minimum, the U.S. Department of Energy (DOE) standard process for commercial energy code determination, then the results of that analysis may be used to correlate local code performance with ANSI/ASHRAE/IESNA Standard 90.1-2007. Details on the DOE process for commercial energy code determination can be found at http://www.energycodes.gov/implement/determinations_com.stm.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 3: Conserving Energy in Historic Buildings
Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

Provisions for glazing, framing, and structural elements can be found in Standard 10 and Tables B-2 and B-3 of the UFC 4-010-01. Glass should be 6 mm thick with an interlayer thickness of 1.50 mm (B-3.1).

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

To prevent airborne contaminants from being introduced to the building, HEPA filters should be applied at air intakes or at the central air-handling unit. The building should also be slightly over pressurized (Class II) (UFC 4-020-01, Chapter 4–6).

EA PREREQUISITE 3: FUNDAMENTAL REFRIGERANT MANAGEMENT – REQUIRED

Intent

To reduce stratospheric ozone depletion.

Requirements

Zero use of chlorofluorocarbon (CFC)-based refrigerants in new base building HVAC and refrigeration systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phase-out conversion prior to project completion. Phase-out plans extending beyond the project completion date will be considered on their merits.

Potential Technologies and Strategies

When reusing existing HVAC systems, conduct an inventory to identify equipment that uses CFC-based refrigerants and provide a replacement schedule for these refrigerants. For new buildings, specify new HVAC equipment in the base building that uses no CFC-based refrigerants.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

To prevent airborne contaminants from being introduced to the building, HEPA filters should be applied at air intakes or at the central air-handling unit. The building should also be slightly over pressurized (Class II) (UFC 4-020-01, Chapter 4–6).

EA CREDIT 1: OPTIMIZE ENERGY PERFORMANCE 1–19 POINTS

Intent

To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

Requirements

Select one of the three compliance path options described below. Project teams documenting achievement using any of the three options are assumed to be in compliance with EA Prerequisite 2: Minimum Energy Performance.

OPTION 1. Whole Building Energy Simulation (1–19 points)
Demonstrate a percentage improvement in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline building performance according to appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) using a computer simulation model for the whole building project. The minimum energy cost savings percentage for each point threshold is as follows:

New Buildings	Existing Building Renovations	Points
12%	8%	1
14%	10%	2
16%	12%	3
18%	14%	4
20%	16%	5
22%	18%	6
24%	20%	7
26%	22%	8
28%	24%	9
30%	26%	10
32%	28%	11
34%	30%	12
36%	32%	13
38%	34%	14
40%	36%	15
42%	38%	16
44%	40%	17
46%	42%	18
48%	44%	19

For the purpose of this analysis, process energy is considered to include, but is not limited to, office and general miscellaneous equipment, computers, elevators and escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g., lighting integral to medical equipment), and other (e.g., waterfall pumps).

Regulated (nonprocess) energy includes lighting (e.g., for the interior, parking garage, surface parking, façade, or building grounds, etc., except as noted above), HVAC (e.g., for space heating, space cooling, fans, pumps, toilet exhaust, parking garage ventilation, kitchen hood exhaust, etc.), and service water heating for domestic or space heating purposes.

OR

OPTION 3. Prescriptive Compliance Path: Advanced Buildings™ Core Performance™ Guide (1–3 points)

Comply with the prescriptive measures identified in the Advanced Buildings™ Core Performance™ Guide developed by the New Buildings Institute. The building must meet the following requirements:

- less than 100,000 sq ft
- comply with Section 1: Design Process Strategies, and Section 2: Core Performance Requirements
- healthcare, warehouse or laboratory projects are ineligible for this path

Points achieved under Option 3 (1 point):

- one point is available for all projects (office, school, public assembly, and retail projects) less than 100,000 sq ft that comply with Sections 1 and 2 of the Core Performance Guide
- up to two additional points are available to projects that implement performance strategies listed in section 3

Enhanced Performance. For every three strategies implemented from this section, 1 point is available. The following strategies are addressed by other aspects of LEED and are not eligible for additional points under EA Credit 1:

- 3.1 – Cool Roofs
- 3.8 – Night Venting
- 3.13 – Additional Commissioning

Potential Technologies and Strategies

Design the building envelope and systems to maximize energy performance. Use a computer simulation model to assess the energy performance and identify the most cost-effective energy efficiency measures. Quantify energy performance compared with a baseline building. If local code has demonstrated quantitative and textual equivalence following, at a minimum, the DOE standard process for commercial energy code determination, the results of that analysis may be used to correlate local code performance with ANSI/ASHRAE/ IESNA Standard 90.1-2007. Details on the DOE process for commercial energy code determination can be found at http://www.energycodes.gov/implement/determinations_com.stm.

Character-defining Features and Historic Preservation

The entire building envelope is a character-defining feature of Building 5 and should be preserved. The flat nature of the roof is also a character-defining feature to be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 3: Conserving Energy in Historic Buildings
Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

To prevent airborne contaminants from being introduced to the building, HEPA filters should be applied at air intakes or at the central air-handling unit. The building should also be slightly over pressurized (Class II) (UFC 4-020-01, Chapter 4-6).

Note: Independent Energy and Security Act 2007 - Subtitle C, High-Performance Federal Buildings Section 431 requires that total energy use in federal buildings, relative to the 2005 level, be reduced 30% by 2015.

EA CREDIT 2: ON-SITE RENEWABLE ENERGY 1–7 POINTS

Intent

To encourage and recognize increasing levels of on-site renewable energy self-supply to reduce environmental and economic impacts associated with fossil fuel energy use.

Requirements

Use on-site renewable energy systems to offset building energy costs. Calculate project performance by expressing the energy produced by the renewable systems as a percentage of the building's annual energy cost and use the table below to determine the number of points achieved.

Use the building annual energy cost calculated in EA Credit 1: Optimize Energy Performance or the DOE's Commercial Buildings Energy Consumption Survey database to determine the estimated electricity use.

The minimum renewable energy percentage for each point threshold is as follows:

Percentage Renewable Energy	Points
1%	1
3%	2
5%	3
7%	4
9%	5
11%	6
13%	7

Potential Technologies and Strategies

Assess the project for nonpolluting and renewable energy potential including solar, wind, geothermal, low-impact hydro, biomass, and bio-gas strategies. When applying these strategies, take advantage of net metering with the local utility.

Character-defining Features and Historic Preservation

The entire building envelope is a character-defining feature of Building 5 and should be preserved. The flat nature of the roof is also a character-defining feature to be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 3: Conserving Energy in Historic Buildings
Preservation Brief 4: Roofing for Historic Buildings

Antiterrorism and Force Protection Considerations

N/A

EA CREDIT 3: ENHANCED COMMISSIONING 2 POINTS

Intent

To begin the commissioning process early in the design process and execute additional activities after systems performance verification is completed.

Requirements

Implement, or have a contract in place to implement, the following additional commissioning process activities in addition to the requirements of EA Prerequisite 1: Fundamental Commissioning of Building Energy Systems and in accordance with the *LEED Reference Guide for Green Building Design and Construction*, 2009 Edition:

- Prior to the start of the construction documents phase, designate an independent commissioning authority (CxA) to lead, review and oversee the completion of all commissioning process activities.
  - The CxA must have documented commissioning authority experience in at least two building projects.
  - The individual serving as the CxA:
    - must be independent of the work of design and construction
    - must not be an employee of the design firm, though he or she may be contracted through them
    - must not be an employee of, or contracted through, a contractor or construction manager holding construction contracts
    - may be a qualified employee or consultant of the owner
  - The CxA must report results, findings and recommendations directly to the owner.

- The CxA must conduct, at a minimum, one commissioning design review of the owner's project requirements basis of design, and design documents prior to the mid-construction documents phase and back-check the review comments in the subsequent design submission.
- The CxA must review contractor submittals applicable to systems being commissioned for compliance with the owner's project requirements and basis of design. This review must be concurrent with the review of the architect or engineer of record and submitted to the design team and the owner.
- The CxA or other project team members must develop a systems manual that gives future operating staff the information needed to understand and optimally operate the commissioned systems.
- The CxA or other project team members must verify that the requirements for training operating personnel and building occupants have been completed.
- The CxA must be involved in reviewing the operation of the building with operations and maintenance (O&M) staff and occupants within 10 months after substantial completion. A plan for resolving outstanding commissioning-related issues must be included.

Potential Technologies and Strategies

The *LEED Reference Guide for Green Building Design and Construction*, 2009 Edition provides detailed guidance on the rigor expected for the following process activities:

- commissioning design review
- commissioning submittal review
- systems manual

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

EA CREDIT 4: ENHANCED REFRIGERANT MANAGEMENT 2 POINTS

Intent

To reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to climate change.

Requirements

OPTION 1
Do not use refrigerants.

OR

OPTION 2
Select refrigerants and HVAC equipment that minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change.

Small HVAC units (defined as containing less than 0.5 pounds of refrigerant) and other equipment, such as standard refrigerators, small water coolers, and any other cooling equipment that contains less than 0.5 pounds of refrigerant, are not considered part of the base building system and are not subject to the requirements of this credit.

Do not operate or install fire suppression systems that contain ozone-depleting substances such as CFCs, hydrochlorofluorocarbons (HCFCs) or halons.

Potential Technologies and Strategies

Design and operate the facility without mechanical cooling and refrigeration equipment. Where mechanical cooling is used, utilize base building HVAC and refrigeration systems for the refrigeration cycle that minimize direct impact on ozone depletion and global climate change. Select HVAC and refrigeration equipment with reduced refrigerant charge and increased equipment life. Maintain equipment to prevent leakage of refrigerant to the atmosphere. Use fire suppression systems that do not contain HCFCs or halons.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 3: Conserving Energy in Historic Buildings
Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

To prevent airborne contaminants from being introduced to the building, HEPA filters should be applied at air intakes or at the central air-handling unit. The building should also be slightly over pressurized (Class II) (UFC 4-020-01, Chapter 4-6).

EA CREDIT 5: MEASUREMENT AND VERIFICATION 3 POINTS

Intent

To provide for the ongoing accountability of building energy consumption over time.

Requirements

OPTION 1

Develop and implement a measurement and verification (M&V) plan consistent with Option D: Calibrated Simulation (Savings Estimation Method 2) as specified in the International Performance Measurement & Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003. The M&V period must cover at least one year of post-construction occupancy. Provide a process for corrective action if the results of the M&V plan indicate that energy savings are not being achieved.

OR

OPTION 2

Develop and implement a measurement and verification (M&V) plan consistent with Option B: Energy Conservation Measure Isolation, as specified in the International Performance Measurement & Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003. The M&V period must cover at least one year of post-construction occupancy. Provide a process for corrective action if the results of the M&V plan indicate that energy savings are not being achieved.

Potential Technologies and Strategies

Develop an M&V plan to evaluate building and/or energy system performance. Characterize the building and/or energy systems through energy simulation or engineering analysis. Install the necessary metering equipment to measure energy use. Track performance by comparing predicted performance to actual performance, broken down by component or system as appropriate. Evaluate energy efficiency by comparing actual performance to baseline performance.

For the corrective action process, consider installing diagnostics within the control system to alert the staff when equipment is not being optimally operated. Conditions that might warrant alarms to alert staff could include:

- Leaking valves in the cooling and heating coils within air handling units.
- Missed economizer opportunities (e.g., faulty economizer damper controls).
- Software and manual overrides allowing equipment to operate 24 hours a day/7 days a week.
- Equipment operation during unusual circumstances (e.g., boiler on when outside air temperature is above 65ºF).

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

EA CREDIT 6: GREEN POWER 2 POINTS

Intent

To encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

Requirements

Engage in at least a two-year renewable energy contract to provide at least 35% of the building's electricity from renewable sources, as defined by the Center for Resource Solutions Green-e Energy product certification requirements.

All purchases of green power shall be based on the quantity of energy consumed, not the cost.

OPTION 1. Determine Baseline Electricity Use
Use the annual electricity consumption from the results of EA Credit 1: Optimize Energy Performance.

OR

OPTION 2. Estimate Baseline Electricity Use
Use the U.S. Department of Energy's Commercial Buildings Energy Consumption Survey database to determine the estimated electricity use.

Potential Technologies and Strategies

Determine the energy needs of the building and investigate opportunities to engage in a green power contract. Green power is derived from solar, wind, geothermal, biomass or low-impact hydro sources. Visit http://www.green-e.org/energy for details about the Green-e Energy program. The green power product purchased to comply with credit requirements need not be Green-e Energy certified. Other sources of green power are eligible if they satisfy the Green-e Energy program's technical requirements. Renewable energy certificates (RECs), tradable renewable certificates (TRCs), green tags and other forms of green power that comply with the technical requirements of the Green-e Energy program may be used to document compliance with this credit.

Character-defining Features and Historic Preservation

A building's character can be irreversibly damaged or changed by altering the setting around the building. The primary character-defining features of the setting for Building 5 would include the views of the front façade from pedestrian or vehicular access. The front façade of the building is currently unobstructed from many vantage points near and far. The vehicular/pedestrian entry to the building is formal, symmetrical and bounded by lawn and trees, although according to historic photographs, the trees were added after 1956. Care should be given to landscaping at the front of the building as well as preserving the approach.

The flat nature of the roof is also a character-defining feature of Building 5 and should be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 3: Conserving Energy in Historic Buildings
Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 36 – Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes
Preservation Brief 47 – Maintaining the Exteriors of Small and Medium Size Historic Buildings

Antiterrorism and Force Protection Considerations

Plantings and furnishings must not constitute an obstruction (within 33 ft of the occupied building) that allows concealment of possible explosive devices 6 inches or greater in height (ATFP B-1.2).

MR PREREQUISITE 1: STORAGE AND COLLECTION OF RECYCLABLES – REQUIRED

Intent

To facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

Requirements

Provide an easily accessible dedicated area or areas for the collection and storage of materials for recycling for the entire building. Materials must include, at a minimum: paper, corrugated cardboard, glass, plastics, and metals.

Potential Technologies and Strategies

Designate an area for recyclable collection and storage that is appropriately sized and located in a convenient area. Identify local waste handlers and buyers for glass, plastic, metals, office paper, newspaper, cardboard, and organic wastes. Instruct occupants on recycling procedures. Consider employing cardboard balers, aluminum can crushers, recycling chutes, and other waste management strategies to further enhance the recycling program.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

If collection area is located exterior to the building and screened with more than two walls, the screening device must be enclosed on all four sides and the top with gaps of no more than 6 inches between the ground and the screen to prevent the hiding of explosives (B-1.2.2).

MR CREDIT 1.1: BUILDING REUSE—MAINTAIN EXISTING WALLS, FLOORS, AND ROOF 1–3 POINTS

Intent

To extend the lifecycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Maintain the existing building structure (including structural floor and roof decking) and envelope (the exterior skin and framing, excluding window assemblies and nonstructural roofing material). The minimum percentage building reuse for each point threshold is as follows:

Building Reuse	Points
65%	1
75%	2
95%	3

Hazardous materials that are remediated as a part of the project must be excluded from the calculation of the percentage maintained. If the project includes an addition that is more than two times the square footage of the existing building, this credit is not applicable.

Potential Technologies and Strategies

Consider reusing existing, previously occupied building structures, envelopes, and elements. Remove elements that pose a contamination risk to building occupants and upgrade components that would improve energy and water efficiency such as windows, mechanical systems, and plumbing fixtures.

Character-defining Features and Historic Preservation

The building envelope is considered a character-defining feature and must be preserved. The flat nature of the roof is also a character-defining feature to be preserved. Inside Building 5, care must be taken to preserve the original porcelain tile and glazed terra-cotta tile in the bathrooms as those are considered character-defining features. The steel sash windows on the control tower and 4th floor are also character-defining features of Building 5 and should be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 4: Roofing for Historic Buildings
Preservation Brief 7: The Preservation of Historic Glazed Architectural Terra-Cotta
Preservation Brief 13: The Repair and Thermal Upgrading of Historic Steel Windows
Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors
Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Features
Preservation Brief 40: Preserving Historic Ceramic Tile Floors
Preservation Brief 47: Maintaining the Exterior of Small and Medium Size Historic Buildings

Antiterrorism and Force Protection Considerations

Provisions for glazing, framing, and structural elements can be found in Standard 10 and Tables B-2 and B-3 of the UFC 4-010-01. Glass should be 6 mm thick with an interlayer thickness of 1.50 mm. (B-3.1).

The building superstructure must be designed to sustain local damage with the structural system as a whole remaining stable (B-2.1).

Exterior doors leading into inhabited areas must open outwards. This minimizes the risk of doors entering the building as hazardous debris during an explosion (B-3.3).

MR CREDIT 1.2: BUILDING REUSE— MAINTAIN INTERIOR NONSTRUCTURAL ELEMENTS 1 POINT

Intent

To extend the lifecycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Use existing interior nonstructural elements (e.g., interior walls, doors, floor coverings and ceiling systems) in at least 50% (by area) of the completed building, including additions. If the project includes an addition with square footage more than two times the square footage of the existing building, this credit is not applicable.

Potential Technologies and Strategies

Consider reusing existing building structures, envelopes and interior nonstructural elements. Remove elements that pose a contamination risk to building occupants, and upgrade components that would improve energy and water efficiency such as mechanical systems and plumbing fixtures. Quantify the extent of building reuse.

Character-defining Features and Historic Preservation

The wood paneling in the control tower, the interior wood and metal doors, and the original steel safe doors are all considered character-defining features of Building 5 and should be preserved. The interior ladders, steel pan stairs, and metal catwalk and concrete stair in the boiler room are also character-defining. Floor-mounted plumbing fixtures are a character-defining element as well.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Features

Antiterrorism and Force Protection Considerations

N/A

MR CREDIT 2: CONSTRUCTION WASTE MANAGEMENT 1–2 POINT

Intent

To divert construction and demolition debris from disposal in landfills and incineration facilities. Redirect recyclable recovered resources back to the manufacturing process and reusable materials to appropriate sites.

Requirements

Recycle and/or salvage nonhazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or comingled. Excavated soil and land-clearing debris do not contribute to this credit.

Calculations can be done by weight or volume, but must be consistent throughout. The minimum percentage debris to be recycled or salvaged for each point threshold is as follows:

Recycled or Salvaged	Points
50%	1
75%	2

Potential Technologies and Strategies

Establish goals for diversion from disposal in landfills and incineration facilities and adopt a construction waste management plan to achieve these goals. Consider recycling cardboard, metal, brick, mineral fiber panel, concrete, plastic, clean wood, glass, gypsum wallboard, carpet, and insulation. Construction debris processed into a recycled content commodity that has an open market value (e.g., wood derived fuel, alternative daily cover material, etc.) may be applied to the construction waste calculation. Designate a specific area(s) on the construction site for segregated or comingled collection of recyclable materials, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

MR CREDIT 3: MATERIALS REUSE 1–2 POINT

Intent

To reuse building materials and products to reduce demand for virgin materials and reduce waste, thereby lessening impacts associated with the extraction and processing of virgin resources.

Requirements

Use salvaged, refurbished or reused materials, the sum of which constitutes at least 5% or 10%, based on cost, of the total value of materials on the project. The minimum percentage materials reused for each point threshold is as follows:

Reused Materials	Points
5%	1
10%	2

Mechanical, electrical and plumbing components and specialty items such as elevators and equipment cannot be included in this calculation. Include only materials permanently installed in the project. Furniture may be included if it is included consistently in MR Credit 3: Materials Reuse through MR Credit 7: Certified Wood.

Potential Technologies and Strategies

Identify opportunities to incorporate salvaged materials into the building design, and research potential material suppliers. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick, and decorative items.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

MR CREDIT 4: RECYCLED CONTENT 1–2 POINT

Intent

To increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

Requirements

Use materials with recycled content1 such that the sum of postconsumer recycled content plus one-half of the preconsumer content constitutes at least 10% or 20%, based on cost of the total value of the materials in the project. The minimum percentage materials recycled for each point threshold is as follows:

Recycled Content	Points
10%	1
20%	2

The recycled content value of a material assembly is determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

Mechanical, electrical and plumbing components and specialty items such as elevators cannot be included in this calculation. Include only materials permanently installed in the project. Furniture may be included if it is included consistently in MR Credit 3: Materials Reuse through MR Credit 7: Certified Wood.

Potential Technologies and Strategies

Establish a project goal for recycled content materials, and identify material suppliers that can achieve this goal. During construction, ensure that the specified recycled content materials are installed. Consider a range of environmental, economic, and performance attributes when selecting products and materials.

Recycled content is defined in accordance with the International Organization of Standards document, ISO 14021—Environmental labels and declarations—Self-declared environmental claims (Type II environmental labeling).

Postconsumer material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Preconsumer material is defined as material diverted from the waste stream during the manufacturing process. Reutilization of materials (i.e., rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it) is excluded.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

MR CREDIT 5: REGIONAL MATERIALS 1–2 POINTS

Intent

To increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

Requirements

Use building materials or products that have been extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site for a minimum of 10% or 20%, based on cost of the total materials value. If only a fraction of a product or material is extracted, harvested, or recovered and manufactured locally, then only that percentage (by weight) can contribute to the regional value. The minimum percentage regional materials for each point threshold is as follows:

Regional Materials	Points
10%	1
20%	2

Mechanical, electrical and plumbing components and specialty items such as elevators and equipment must not be included in this calculation. Include only materials permanently installed in the project.

Furniture may be included if it is included consistently in MR Credit 3: Materials Reuse through MR Credit 7: Certified Wood.

Potential Technologies and Strategies

Establish a project goal for locally sourced materials, and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed, and quantify the total percentage of local materials installed. Consider a range of environmental, economic and performance attributes when selecting products and materials.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

MR CREDIT 6: RAPIDLY RENEWABLE MATERIALS 1 POINT

Intent

To reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.

Requirements

Use rapidly renewable building materials and products for 2.5% of the total value of all building materials and products used in the project, based on cost. Rapidly renewable building materials and products are made from plants that are typically harvested within a 10-year or shorter cycle.

Potential Technologies and Strategies

Establish a project goal for rapidly renewable materials, and identify products and suppliers that can support achievement of this goal. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard, and cork. During construction, ensure that the specified renewable materials are installed.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

MR CREDIT 7: CERTIFIED WOOD 1 POINT

Intent

To encourage environmentally responsible forest management.

Requirements

Use a minimum of 50% (based on cost) of wood-based materials and products that are certified in accordance with the Forest Stewardship Council's principles and criteria for wood building components. These components include at a minimum, structural framing and general dimensional framing, flooring, sub-flooring, wood doors, and finishes.

Include only materials permanently installed in the project. Wood products purchased for temporary use on the project (e.g., formwork, bracing, scaffolding, sidewalk protection, and guard rails) may be included in the calculation at the project team's discretion. If any such materials are included, all such materials must be included in the calculation. If such materials are purchased for use on multiple projects, the applicant may include these materials for only one project, at its discretion. Furniture may be included if it is included consistently in MR Credits 3, Materials Reuse, through MR Credit 7, Certified Wood.

Potential Technologies and Strategies

Establish a project goal for FSC-certified wood products and identify suppliers that can achieve this goal. During construction, ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC-certified wood products installed.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

IE Q PREREQUISITE 1: MINIMUM INDOOR AIR QUALITY PERFORMANCE – REQUIRED

Intent

To establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.

Requirements

CASE 1. Mechanically Ventilated Spaces
Meet the minimum requirements of Sections 4 through 7 of ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality (with errata but without addenda1). Mechanical ventilation systems must be designed using the ventilation rate procedure or the applicable local code, whichever is more stringent.

CASE 2. Naturally Ventilated Spaces
Naturally ventilated buildings must comply with ASHRAE Standard 62.1-2007, Paragraph 5.1 (with errata but without addenda).

Potential Technologies and Strategies

Design ventilation systems to meet or exceed the minimum outdoor air ventilation rates as described in the ASHRAE standard. Balance the impacts of ventilation rates on energy use and indoor air quality to optimize for energy efficiency and occupant comfort. Use the ASHRAE Standard 62.1-2007 Users Manual (with errata but without addenda) for detailed guidance on meeting the referenced requirements.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements
Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

To prevent airborne contaminants from being introduced to the building, HEPA filters should be applied at air intakes or at the central air-handling unit. The building should also be slightly over pressurized (Class II) (UFC 4-020-01, Chapter 4-6).

IE Q PREREQUISITE 2: ENVIRONMENTAL TOBACCO SMOKE (ET S) CONTROL – REQUIRED

Intent

To prevent or minimize exposure of building occupants, indoor surfaces and ventilation air distribution systems to environmental tobacco smoke (ETS).

Requirements

CASE 1. All Projects

OPTION 1
Prohibit smoking in the building.

Prohibit on-property smoking within 25 feet of entries, outdoor air intakes, and operable windows. Provide signage to allow smoking in designated areas, prohibit smoking in designated areas, or prohibit smoking on the entire property.

OR

OPTION 2
Prohibit smoking in the building except in designated smoking areas. Prohibit on-property smoking within 25 ft of entries, outdoor air intakes, and operable windows. Provide signage to allow smoking in designated areas, prohibit smoking in designated areas, or prohibit smoking on the entire property.

Provide designated smoking rooms designed to contain, capture, and remove ETS from the building. At a minimum, the smoking room must be directly exhausted to the outdoors, away from air intakes and building entry paths, with no recirculation of ETS-containing air to nonsmoking areas and enclosed with impermeable deck-to-deck partitions.

Potential Technologies and Strategies

Prohibit smoking in commercial buildings or effectively control the ventilation air in smoking rooms.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches.

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

IE Q CREDIT 1: OUTDOOR AIR DELIVERY MONITORING 1 POINT

Intent

To provide capacity for ventilation system monitoring to help promote occupant comfort and well-being.

Requirements

Install permanent monitoring systems to ensure that ventilation systems maintain design minimum requirements. Configure all monitoring equipment to generate an alarm when airflow values or carbon dioxide (CO_2) levels vary by 10% or more from the design values via either a building automation system alarm to the building operator or a visual or audible alert to the building occupants.

AND

CASE 1. Mechanically Ventilated Spaces
Monitor CO_2 concentrations within all densely occupied spaces (those with a design occupant density of 25 people or more per 1,000 sq ft). CO_2 monitors must be between 3 ft and 6 ft above the floor.

Provide a direct outdoor airflow measurement device capable of measuring the minimum outdoor air intake flow with an accuracy of plus or minus 15% of the design minimum outdoor air rate, as defined by ASHRAE Standard 62.1-2007 (with errata but without addenda) for mechanical ventilation systems where 20% or more of the design supply airflow serves nondensely occupied spaces.

CASE 2. Naturally Ventilated Spaces
Monitor CO_2 concentrations within all naturally ventilated spaces. CO_2 monitors must be between 3 ft and 6 ft above the floor. One CO_2 sensor may be used to monitor multiple nondensely occupied spaces if the natural ventilation design uses passive stack(s) or other means to induce airflow through those spaces equally and simultaneously without intervention by building occupants.

Potential Technologies and Strategies

Install CO_2 and airflow measurement equipment and feed the information to the HVAC system and/or building automation system to trigger corrective action, if applicable. If such automatic controls are not feasible with the building systems, use the measurement equipment to trigger alarms that inform building operators or occupants of a possible deficiency in outdoor air delivery.

Project teams wishing to use ASHRAE approved addenda for the purposes of this credit may do so at their discretion. Addenda must be applied consistently across all LEED credits.

CO_2 monitoring is required in densely occupied spaces, in addition to outdoor air intake flow measurement.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements
Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

IE Q CREDIT 2: INCREASED VENTILATION 1 POINT

Intent

To provide additional outdoor air ventilation to improve indoor air quality (IAQ) and promote occupant comfort, well-being, and productivity.

Requirements

CASE 1. Mechanically Ventilated Spaces
Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates required by ASHRAE Standard 62.1-2007 (with errata but without addenda) as determined by IEQ Prerequisite 1: Minimum Indoor Air Quality Performance.

CASE 2. Naturally Ventilated Spaces
Design natural ventilation systems for occupied spaces to meet the recommendations set forth in the Carbon Trust Good Practice Guide 237 (1998). Determine that natural ventilation is an effective strategy for the project by following the flow diagram process shown in figure 1.18 of the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual 10: 2005, Natural Ventilation in Nondomestic Buildings.

AND

OPTION 1
Use diagrams and calculations to show that the design of the natural ventilation systems meets the recommendations set forth in the CIBSE Applications Manual 10: 2005, Natural Ventilation in Nondomestic Buildings.

OR

OPTION 2
Use a macroscopic, multizone, analytic model to predict that room-by-room airflows will effectively naturally ventilate, defined as providing the minimum ventilation rates required by ASHRAE 62.1-2007 chapter 6 (with errata but without addenda), for at least 90% of occupied spaces.

Potential Technologies and Strategies

For mechanically ventilated spaces: Use heat recovery, where appropriate, to minimize the additional energy consumption associated with higher ventilation rates.

For naturally ventilated spaces: Follow the eight design steps described in the Carbon Trust Good Practice Guide 237:

- develop design requirements
- plan airflow paths
- identify building uses and features that might require special attention
- determine ventilation requirements
- estimate external driving pressures

- select types of ventilation devices
- size ventilation devices
- analyze the design

Use public domain software such as NIST's CONTAM, Multizone Modeling Software, along with LoopDA, Natural Ventilation Sizing Tool, to analytically predict room-by-room airflows.

Project teams wishing to use ASHRAE-approved addenda for the purposes of this credit may do so at their discretion. Addenda must be applied consistently across all LEED credits.

Character-defining Features and Historic Preservation

The original steel sash windows on the control tower and 4th floor are a character-defining feature of the building and should be preserved. The glass block window on the west elevation also marks a character-defining feature and should be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 3:Conserving Energy in Historic Buildings
Preservation Brief 13:The Repair and Thermal Upgrading of Historic Steel Windows
Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

To prevent airborne contaminants from being introduced to the building, HEPA filters should be applied at air intakes or at the central air-handling unit. The building should also be slightly over pressurized (Class II) (UFC 4-020-01, chapter 4-6).

IE Q CREDIT 3.1: CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN— DURING CONSTRUCTION 1 POINT

Intent

To reduce indoor air quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of construction workers and building occupants.

Requirements

Develop and implement an IAQ management plan for the construction and preoccupancy phases of the building as follows:

- During construction, meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) *IAQ Guidelines For Occupied Buildings Under Construction, 2nd Edition* 2007, ANSI/SMACNA 008-2008 (chapter 3).
- Protect stored on-site and installed absorptive materials from moisture damage.
- If permanently installed air handlers are used during construction, filtration media with a minimum efficiency reporting value (MERV) of eight must be used at each return air grille, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda). Replace all filtration media immediately prior to occupancy.

Potential Technologies and Strategies

Adopt an IAQ management plan to protect the HVAC system during construction, control pollutant sources, and interrupt contamination pathways. Sequence the installation of materials to avoid contamination of absorptive materials, such as insulation, carpeting, ceiling tile, and gypsum wallboard. Coordinate with IEQ Credit 3.2: Construction IAQ Management Plan — Before Occupancy and IEQ Credit 5: Indoor Chemical & Pollutant Source Control to determine the appropriate specifications and schedules for filtration media.

If possible, avoid using permanently installed air handlers for temporary heating/cooling during construction. Consult the LEED Reference Guide for Green Building Design and Construction, 2009 Edition for more detailed information on how to ensure the well-being of construction workers and building occupants if permanently installed air handlers must be used during construction. Project teams wishing to use ASHRAE-approved addenda for the purposes of this credit may do so at their discretion. Addenda must be applied consistently across all LEED credits.

Character-defining Features and Historic Preservation

Construction activities must avoid damaging all character-defining features of Building 5.

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

IE Q CREDIT 3.2: CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN—BEFORE OCCUPANCY 1 POINT

Intent

To reduce indoor air quality (IAQ) problems resulting from construction or renovation to promote the comfort and well-being of construction workers and building occupants.

Requirements

Develop an IAQ management plan and implement it after all finishes have been installed and the building has been completely cleaned before occupancy.

OPTION 1. Flush-Out

PAT H 1
After construction ends, prior to occupancy and with all interior finishes installed, install new filtration media and, perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60ºF and relative humidity no higher than 60%.

OR

PAT H 2
If occupancy is desired prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of floor area. Once the space is occupied, it must be ventilated at a minimum rate of 0.30 cubic feet per minute (cfm) per square foot of outside air or the design minimum outside air rate determined in IEQ Prerequisite 1: Minimum Indoor Air Quality Performance, whichever is greater. During each day of the flush-out period, ventilation must begin a minimum of 3 hours prior to occupancy and continue during occupancy. These conditions must be maintained until a total of 14,000 cubic feet per square foot of outside air has been delivered to the space.

OR

OPTION 2. Air Testing
Conduct baseline IAQ testing after construction ends and prior to occupancy using testing protocols consistent with the EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air and as additionally detailed in the *LEED Reference Guide for Green Building Design and Construction*, 2009 Edition.

Demonstrate that the contaminant maximum concentration levels listed below are not exceeded:

Contaminant	Maximum Concentration
Formaldehyde	27 parts per billion
Particulates (PM10)	50 micrograms per cubic meter
Total volatile organic compounds (TVOCs)	500 micrograms per cubic meter
4-Phenylcyclohexene (4-PCH)*	6.5 micrograms per cubic meter
Carbon monoxide (CO)	9 part per million and no greater than 2 parts per million above outdoor levels

* This test is only required if carpets and fabrics with styrene butadiene rubber (SBR) latex backing are installed as part of the base building systems.

Potential Technologies and Strategies

Prior to occupancy, perform a building flush-out or test the air contaminant levels in the building. The flush-out is often used where occupancy is not required immediately upon substantial completion of construction. IAQ testing can minimize schedule impacts but may be more costly. Coordinate with IEQ Credit 3.1: Construction IAQ Management Plan—During Construction and IEQ Credit 5: Indoor Chemical & Pollutant Source Control to determine the appropriate specifications and schedules for filtration media.

The intent of this credit is to eliminate IAQ problems that occur as a result of construction. Architectural finishes used in tenant build-outs constitute a significant source of air pollutants and must be addressed to qualify for this credit. All finishes must be installed prior to flush-out.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

N/A

IE Q CREDIT 4.1: LOW-EMITTING MATERIALS— ADHESIVES AND SEALANTS 1 POINT

Intent

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements

All adhesives and sealants used on the interior of the building (i.e., inside of the weatherproofing system and applied on-site) must comply with the following requirements as applicable to the project scope:

- Adhesives, Sealants and Sealant Primers must comply with South Coast Air Quality Management District (SCAQMD) Rule 1168. Volatile organic compound (VOC) limits listed in the table below correspond to an effective date of 1 July 2005 and rule amendment date of 7 January 2005.

Architectural Application	**VOC limit (g/l, less water)**	**Specialty Application**	**VOC Limit (g/l less water)**
Indoor carpet adhesives	50	PVC welding	510
Carpet pad adhesives	50	CPVC welding	490
Wood flooring adhesives	100	ABS welding	325
Rubber floor adhesives	60	Plastic cement welding	250
Subfloor adhesives	50	Adhesive for primer for plastic	550
Ceramic tile adhesives	65	Contact adhesives	80
VCT and asphalt adhesives	50	Special purpose contact adhesives	250
Drywall and panel adhesives	50	Structural wood member adhesives	140
Cove base adhesives	50	Sheet applied rubber lining operations	850
Multipurpose construction adhesives	70	Top and trim adhesives	250
Structural glazing adhesives	100		
Substrate Specific Applications	**VOC limit (g/l, less water)**	**Sealants**	**VOC limit (g/l, less water)**
Metal to metal	30	Architectural	250
Plastic foams	50	Non-membrane roof	300
Porous materials (except wood)	50	Roadway	250
Wood	30	Single-ply roof membrane	450
Fiberglass	80	Other	420
Sealant Primers	**VOC limit (g/l, less water)**		
Architectural, nonporous	250		
Architectural, porous	775		
Other	750		

1 The use of a VOC budget is permissible for compliance with this credit.

Aerosol Adhesives must comply with Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on 19 October 2000.

Aerosol Adhesives	VOC Limit
General purpose mist spray	65% VOCs by weight
General purpose web spray	55% VOCs by weight
Special purpose aerosol adhesives (all types)	70% VOCs by weight

Potential Technologies and Strategies

Specify low-VOC materials in construction documents. Ensure that VOC limits are clearly stated in each section of the specifications where adhesives and sealants are addressed. Common products to evaluate include general construction adhesives, flooring adhesives, fire-stopping sealants, caulking, duct sealants, plumbing adhesives, and cove base adhesives. Review product cut sheets, material safety data (MSD) sheets, signed attestations or other official literature from the manufacturer clearly identifying the VOC contents or compliance with referenced standards.

Character-defining Features and Historic Preservation

Applicable Department of the Interior Preservation Briefs

Preservation Brief 1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings
Preservation Brief 6: Dangers of Abrasive Cleaning to Historic Buildings
Preservation Brief 7: The Preservation of Historic Glazed Architectural Terra-Cotta
Preservation Brief 21: Repairing Historic Flat Plaster – Walls and Ceilings
Preservation Brief 28: Painting Historic Interiors
Preservation Brief 37: Appropriate Methods of Reducing Lead Paint Hazards in Historic Housing
Preservation Brief 40: Preserving Historic Ceramic Tile Floors

Antiterrorism and Force Protection Considerations

N/A

IE Q CREDIT 4.2: LOW-EMITTING MATERIALS— PAINTS AND COATINGS 1 POINT

Intent

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements

Paints and coatings used on the interior of the building (i.e., inside of the weatherproofing system and applied on-site) must comply with the following criteria as applicable to the project scope:

- Architectural paints and coatings applied to interior walls and ceilings must not exceed the volatile organic compound (VOC) content limits established in Green Seal Standard GS-11, Paints, 1st Edition, 20 May 1993.
- Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, 7 January 1997.
- Clear wood finishes, floor coatings, stains, primers, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on 1 January 2004.

Potential Technologies and Strategies

Specify low-VOC paints and coatings in construction documents. Ensure that VOC limits are clearly stated in each section of the specifications where paints and coatings are addressed. Track the VOC content of all interior paints and coatings during construction.

The use of a VOC budget is permissible for compliance with this credit.

Character-defining Features and Historic Preservation

Applicable Department of the Interior Preservation Briefs

Preservation Brief 1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings
Preservation Brief 6: Dangers of Abrasive Cleaning to Historic Buildings
Preservation Brief 7: The Preservation of Historic Glazed Architectural Terra-Cotta
Preservation Brief 21: Repairing Historic Flat Plaster – Walls and Ceilings
Preservation Brief 28: Painting Historic Interiors
Preservation Brief 37: Appropriate Methods of Reducing Lead-Paint Hazards in Historic Housing
Preservation Brief 40: Preserving Historic Ceramic Tile Floors

Antiterrorism and Force Protection Considerations

N/A

IE Q CREDIT 4.3: LOW-EMITTING MATERIALS— FLOORING SYSTEMS 1 POINT

Intent

To reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well-being of installers and occupants.

Requirements

OPTION 1
All flooring must comply with the following as applicable to the project scope:

- All carpet installed in the building interior must meet the testing and product requirements of the Carpet and Rug Institute Green Label Plus1 program.
- All carpet cushion installed in the building interior must meet the requirements of the Carpet and Rug Institute Green Label program.
- All carpet adhesive must meet the requirements of IEQ Credit 4.1: Adhesives and Sealants, which includes a volatile organic compound (VOC) limit of 50 g/L.
- All hard surface flooring must be certified as compliant with the FloorScore standard (current as of the date of this rating system, or more stringent version) by an independent third-party. Flooring products covered by FloorScore include vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring, and wall base.
- An alternative compliance path using FloorScore is acceptable for credit achievement: 100% of the non-carpet finished flooring must be FloorScore-certified and must constitute at least 25% of the finished floor area. Examples of unfinished flooring include floors in mechanical rooms, electrical rooms and elevator service rooms.
- Concrete, wood, bamboo, and cork floor finishes such as sealer, stain and finish must meet the requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on 1 January 2004.
- Tile setting adhesives and grout must meet South Coast Air Quality Management District (SCAQMD) Rule 1168. VOC limits correspond to an effective date of 1 July 2005 and rule amendment date of 7 January 2005.

The Green Label Plus program for carpets and its associated VOC emission criteria in micrograms per square meter per hour, along with information on testing method and sample collection developed by the Carpet & Rug Institute (CRI) in coordination with California's Sustainable Building Task Force and the California Department of Public Health, are described in Section 9, Acceptable Emissions Testing for Carpet, DHS Standard Practice CA/DHS/EHLB/R-174, dated 07/15/04. This document is available at http://www.dhs.ca.gov/ps/deodc/ehlb/iaq/VOCS/Section01350_7_15_2004_FINAL_PLUS_ADDENDUM-2004-01.pdf (also published as Section 01350 Section 9 [dated 2004] by the Collaborative for High Performance Schools [http://www.chps.net]).

FloorScore is a voluntary, independent certification program that tests and certifies hard surface flooring and associated products for compliance with criteria adopted in California for indoor air emissions of VOCs with potential health effects. The program uses a small-scale chamber test protocol and incorporates VOC emissions criteria, which are widely known as Section 1350, developed by the California Department of Health Services.

OR

OPTION 2
All flooring elements installed in the building interior must meet the testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

Potential Technologies and Strategies

Clearly specify requirements for product testing and/or certification in the construction documents. Select products that are either certified under the Green Label Plus program or for which testing has been done by qualified independent laboratories in accordance with the appropriate requirements.

Character-defining Features and Historic Preservation

The original porcelain tile lining the bathroom floors is a character-defining feature of Building 5, as is the original wood planking in the control tower. These must be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings
Preservation Brief 40: Preserving Historic Ceramic Tile Floors

Antiterrorism and Force Protection Considerations

N/A

IE Q CREDIT 4.4: LOW-EMITTING MATERIALS— COMPOSITE WOOD AND AGRIFIBER PRODUCTS 1 POINT

Intent

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements

Composite wood and agrifiber products used on the interior of the building (i.e., inside the weather-proofing system) must contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies must not contain added urea-formaldehyde resins. Composite wood and agrifiber products are defined as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores. Materials considered fixtures, furniture and equipment (FF&E) are not considered base building elements and are not included.

Potential Technologies and Strategies

Specify wood and agrifiber products that contain no added urea-formaldehyde resins. Specify laminating adhesives for field and shop-applied assemblies that contain no added urea-formaldehyde resins. Review product cut sheets, material safety data (MSD) sheets, signed attestations or other official literature from the manufacturer.

Character-defining Features and Historic Preservation

Applicable Department of the Interior Preservation Briefs

Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements

Antiterrorism and Force Protection Considerations

N/A

IE Q CREDIT 5: INDOOR CHEMICAL AND POLLUTANT SOURCE CONTROL 1 POINT

Intent

To minimize building occupant exposure to potentially hazardous particulates and chemical pollutants.

Requirements

Design to minimize and control the entry of pollutants into buildings and later cross-contamination of regularly occupied areas through the following strategies:

- Employ permanent entryway systems at least 10 ft long in the primary direction of travel to capture dirt and particulates entering the building at regularly used exterior entrances. Acceptable entryway systems include permanently installed grates, grills, and slotted systems that allow for cleaning underneath. Roll-out mats are acceptable only when maintained on a weekly basis by a contracted service organization.
- Sufficiently exhaust each space where hazardous gases or chemicals may be present or used (e.g., garages, housekeeping and laundry areas, copying and printing rooms) to create negative pressure with respect to adjacent spaces when the doors to the room are closed. For each of these spaces, provide self-closing doors and deck-to-deck partitions or a hard-lid ceiling. The exhaust rate must be at least 0.50 cubic feet per minute (cfm) per square foot with no air recirculation. The pressure differential with the surrounding spaces must be at least 5 Pascals (Pa) (0.02 inches of water gauge) on average and 1 Pa (0.004 inches of water) at a minimum when the doors to the rooms are closed.
- In mechanically ventilated buildings, install new air filtration media in regularly occupied areas prior to occupancy; these filters must provide a minimum efficiency reporting value (MERV) of 13 or higher. Filtration should be applied to process both return and outside air that is delivered as supply air.
- Provide containment (i.e., a closed container for storage for off-site disposal in a regulatory compliant storage area, preferably outside the building) for appropriate disposal of hazardous liquid wastes in places where water and chemical concentrate mixing occurs (e.g., housekeeping, janitorial, and science laboratories).

Potential Technologies and Strategies

Design facility cleaning and maintenance areas with isolated exhaust systems for contaminants. Maintain physical isolation from the rest of the regularly occupied areas of the building. Install permanent architectural entryway systems such as grills or grates to prevent occupant-borne contaminants from entering the building. Install high level filtration systems in air handling units processing both return air and outside supply air. Ensure that air handling units can accommodate required filter sizes and pressure drops.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

To prevent airborne contaminants from being introduced to the building, HEPA filters should be applied at air intakes or at the central air-handling unit. The building should also be slightly over pressurized (Class II) (UFC 4-020-01, chapter 4-6).

IE Q CREDIT 6.1: CONTROLLABILITY OF SYSTEMS—LIGHTING 1 POINT

Intent

To provide a high level of lighting system control by individual occupants or groups in multioccupant spaces (e.g., classrooms and conference areas) and promote their productivity, comfort, and well-being.

Requirements

Provide individual lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences. Provide lighting system controls for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences.

Potential Technologies and Strategies

Design the building with occupant controls for lighting. Strategies to consider include lighting controls and task lighting. Integrate lighting systems controllability into the overall lighting design, providing ambient and task lighting while managing the overall energy use of the building.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 3: Conserving Energy in Historic Buildings
Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Features

Antiterrorism and Force Protection Considerations

N/A

IE Q CREDIT 6.2: CONTROLLABILITY OF SYSTEMS— THERMAL COMFORT 1 POINT

Intent

To provide a high level of thermal comfort system control1 by individual occupants or groups in multi-occupant spaces (e.g., classrooms or conference areas) and promote their productivity, comfort, and well-being.

Requirements

Provide individual comfort controls for 50% (minimum) of the building occupants to enable adjustments to meet individual needs and preferences. Operable windows may be used in lieu of controls for occupants located 20 ft inside and 10 ft to either side of the operable part of a window. The areas of operable window must meet the requirements of ASHRAE Standard 62.1-2007 paragraph 5.1 Natural Ventilation (with errata but without addenda). Provide comfort system controls for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences.

Conditions for thermal comfort are described in ASHRAE Standard 55-2004 (with errata but without addenda) and include the primary factors of air temperature, radiant temperature, air speed, and humidity.

Potential Technologies and Strategies

Design the building and systems with comfort controls to allow adjustments to suit individual needs or those of groups in shared spaces. ASHRAE Standard 55-2004 (with errata but without addenda) identifies the factors of thermal comfort and a process for developing comfort criteria for building spaces that suit the needs of the occupants involved in their daily activities. Control strategies can be developed to expand on the comfort criteria and enable individuals to make adjustments to suit their needs and preferences. These strategies may involve system designs incorporating operable windows, hybrid systems integrating operable windows and mechanical systems, or mechanical systems alone. Individual adjustments may involve individual thermostat controls; local diffusers at floor, desk, or overhead levels; control of individual radiant panels or other means integrated into the overall building; thermal comfort systems and energy systems design.

For the purposes of this credit, comfort system control is defined as control over at least one of the following primary factors in the occupant's vicinity: air temperature, radiant temperature, air speed, and humidity.

Project teams wishing to use ASHRAE approved addenda for the purposes of this credit may do so at their discretion. Addenda must be applied consistently across all LEED credits.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

IE Q CREDIT 7.1: THERMAL COMFORT—DESIGN 1 POINT

Intent

To provide a comfortable thermal environment that promotes occupant productivity and well-being.

Requirements

Design HVAC systems and the building envelope to meet the requirements of ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy (with errata but without addenda). Demonstrate design compliance in accordance with the section 6.1.1 documentation.

Potential Technologies and Strategies

Establish comfort criteria according to ASHRAE 55-2004 (with errata but without addenda) that support the desired quality and occupant satisfaction with building performance. Design the building envelope and systems with the capability to meet the comfort criteria under expected environmental and use conditions. Evaluate air temperature, radiant temperature, air speed, and relative humidity in an integrated fashion, and coordinate these criteria with IEQ Prerequisite 1: Minimum IAQ Performance, IEQ Credit 1: Outdoor Air Delivery Monitoring, and IEQ Credit 2: Increased Ventilation.

Project teams wishing to use ASHRAE-approved addenda for the purposes of this credit may do so at their discretion. Addenda must be applied consistently across all LEED credits.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements
Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

IE Q CREDIT 7.2: THERMAL COMFORT—VERIFICATION 1 POINT IN ADDITION TO IEQ CREDIT 7.1

Intent

To provide for the assessment of building occupant thermal comfort over time.

Requirements

Achieve IEQ Credit 7.1: Thermal Comfort—Design
Provide a permanent monitoring system to ensure that building performance meets the desired comfort criteria as determined by IEQ Credit 7.1: Thermal Comfort—Design.

Agree to conduct a thermal comfort survey of building occupants within 6 to 18 months after occupancy. This survey should collect anonymous responses about thermal comfort in the building, including an assessment of overall satisfaction with thermal performance and identification of thermal comfort-related problems. Agree to develop a plan for corrective action if the survey results indicate that more than 20% of occupants are dissatisfied with thermal comfort in the building. This plan should include measurement of relevant environmental variables in problem areas in accordance with ASHRAE Standard 55-2004 (with errata but without addenda).

Potential Technologies and Strategies

ASHRAE 55-2004 provides guidance for establishing thermal comfort criteria and documenting and validating building performance to the criteria. While the standard is not intended for purposes of continuous monitoring and maintenance of the thermal environment, the principles expressed in the standard provide a basis for the design of monitoring and corrective action systems.

Project teams wishing to use ASHRAE approved addenda for the purposes of this credit may do so at their discretion. Addenda must be applied consistently across all LEED credits.

Character-defining Features and Historic Preservation

N/A

Applicable Department of the Interior Preservation Briefs

Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying Character-Defining Elements
Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches

Antiterrorism and Force Protection Considerations

An emergency shutoff switch must be provided in the HVAC control system to immediately shut down the air distribution system throughout the building (B-4.3).

It is recommended that outside air intakes distributing air throughout the building be at least 10 ft (3 meters) aboveground to prevent aggressors from placing contaminants where they could easily be drawn into the building (B-4.1.2).

IE Q CREDIT 8.1: DAYLIGHT AND VIEWS—DAYLIGHT 1 POINT

Intent

To provide building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

Requirements

Through one of the four options, achieve daylighting in at least the following spaces:

For 75% of Regularly Occupied Spaces 1 point

OPTION 1. Simulation
Demonstrate through computer simulations that 75% or more of all regularly occupied spaces achieve daylight illuminance levels of a minimum of 25 footcandles (fc) and a maximum of 500 fc in a clear sky condition on 21 September at 9:00 a.m. and 3:00 p.m. Areas with illuminance levels below or above the range do not comply. However, designs that incorporate view-preserving automated shades for glare control may demonstrate compliance for only the minimum 25 fc illuminance level.

OR

OPTION 2. Prescriptive
Use a combination of side lighting and/or top lighting to achieve a total daylighting zone that is at least 75% of all the regularly occupied spaces.

Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits.

OR

OPTION 3. Measurement
Demonstrate through records of indoor light measurements that a minimum daylight illumination level of 25 fc has been achieved in at least 75% of all regularly occupied areas. Measurements must be taken on a 10 ft grid for all occupied spaces and recorded on building floor plans.

Only the square footage associated with the portions of rooms or spaces meeting the minimum illumination requirements may be counted in the calculations.

For all projects pursuing this option, provide daylight redirection and/or glare control devices to avoid high contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by daylight will be considered on their merits.

OR

OPTION 4. Combination
Any of the above calculation methods may be combined to document the minimum daylight illumination in at least 75% of all regularly occupied spaces. The different methods used in each space must be clearly recorded on all building plans.

In all cases, only the square footage associated with the portions of rooms or spaces meeting the requirements may be applied toward the 75% of total area calculation required to qualify for this credit. In all cases, provide glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits.

Potential Technologies and Strategies

Design the building to maximize interior daylighting. Strategies to consider include building orientation, shallow floor plates, increased building perimeter, exterior and interior permanent shading devices, high-performance glazing, and high-ceiling reflectance values; additionally, automatic photocell-based controls can help to reduce energy use. Predict daylight factors via manual calculations or model daylighting strategies with a physical or computer model to assess foot candle levels and daylight factors achieved.

Character-defining Features and Historic Preservation

The original steel sash windows on the control tower and 4th floor are a character-defining feature of the building and should be preserved. The glass block window on the west elevation also marks a character-defining feature and should be preserved.

Applicable Department of the Interior Preservation Briefs

Preservation Brief 13: The Repair and Thermal Upgrading of Historic Steel Windows
Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors
Preservation Brief 47: Maintaining the Exterior of Small and Medium Size Historic Buildings

Antiterrorism and Force Protection Considerations

Provisions for glazing, framing, and structural elements can be found in Standard 10 and Tables B-2 and B-3 of the UFC 4-010-01. Glass should be 6 mm thick with an interlayer thickness of 1.50 mm (B-3.1).

IE Q CREDIT 8.2: DAYLIGHT AND VIEWS—VIEWS 1 POINT

Intent

To provide building occupants a connection to the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

Requirements

Achieve a direct line of sight to the outdoor environment via vision glazing between 30 inches and 90 inches above the finish floor for building occupants in 90% of all regularly occupied areas. Determine the area with a direct line of sight by totaling the regularly occupied square footage that meets the following criteria:

- In plain view, the area is within sight lines drawn from perimeter vision glazing.
- In section view, a direct sight line can be drawn from the area to perimeter vision glazing.

The line of sight may be drawn through interior glazing. For private offices, the entire square footage of the office may be counted if 75% or more of the area has a direct line of sight to perimeter vision glazing. For multioccupant spaces, the actual square footage with a direct line of sight to perimeter vision glazing is counted.

Potential Technologies and Strategies

Design the space to maximize daylighting and view opportunities. Strategies to consider include lower partitions, interior shading devices, interior glazing and automatic photocell-based controls.

Character-defining Features and Historic Preservation

The original steel sash windows on the control tower and 4th floor are a character-defining feature of the building and should be preserved. The glass block window on the west elevation also marks a character-defining feature and should be preserved.

Applicable Department of the Interior Preservation Briefs

N/A

Antiterrorism and Force Protection Considerations

Provisions for glazing, framing, and structural elements can be found in Standard 10 and Tables B-2 and B-3 of the UFC 4-010-01. Glass should be 6 mm thick with an interlayer thickness of 1.50 mm (B-3.1).

ID CREDIT 1: INNOVATION IN DESIGN 1–5 POINTS

Intent

To provide design teams and projects the opportunity to achieve exceptional performance above the requirements set by the LEED Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED Green Building Rating System.

Requirements

Credit can be achieved through any combination of the Innovation in Design and Exemplary Performance paths as described below:

PATH 1. Innovation in Design (1-5 points)
Achieve significant, measurable environmental performance using a strategy not addressed in the LEED 2009 for New Construction and Major Renovations Rating System.

One point is awarded for each innovation achieved. No more than 5 points under IDc1 may be earned through:

PATH 1—Innovation in Design.
Identify the following in writing:

- The intent of the proposed innovation credit.
- The proposed requirement for compliance.
- The proposed submittals to demonstrate compliance.
- The design approach (strategies) used to meet the requirements.

PATH 2. Exemplary Performance (1-3 points)
Achieve exemplary performance in an existing LEED 2009 for New Construction and Major Renovations prerequisite or credit that allows exemplary performance as specified in the *LEED Reference Guide for Green Building Design & Construction*, 2009 Edition. An exemplary performance point may be earned for achieving double the credit requirements and/or achieving the next incremental percentage threshold of an existing credit in LEED.

One point is awarded for each exemplary performance achieved. No more than three points under IDc1 may be earned through PATH—Exemplary Performance.

Potential Technologies and Strategies

Substantially exceed a LEED 2009 for New Construction and Major Renovations performance credit such as energy performance or water efficiency. Apply strategies or measures that demonstrate a comprehensive approach and quantifiable environment and/or health benefits.

<u>Path 1 – examples</u>

Provide an educational program on the environmental program and human health benefits of green building practices.

Evaluate a substantial quantity of products or materials being used on the basis of an ISO 140140 life-cycle assessment.

Divert significant volumes of waste generated from sources other than the project building site and associated grounds via expanded waste management and diversion programs.

Path 2 – Exemplary performance

Focus Area	Point	Strategy	Achievable
Sustainable Sites			
SS Credit 2	Development Density and Community Connectivity	—	N/A
SS Credit 4	Alternative Transportation	Institute a comprehensive transportation management plan to reduce personal automobile use through any of multiple options	N/A
SS Credit 5	Site Development	Double amount of open space	
SS Credit 6	Stormwater Design	Comprehensive approach to capture and treat stormwater runoff and demonstrating performance above and beyond credit	
SS Credit 7	Heat Island Effect	100% of nonroof constructed with high albedo or open grid, or shaded within 5 years, or 100% parking under cover	
Water Efficiency			
WE Credit 2	Innovative Wastewater Technologies	100% reduction in potable water use for sewage conveyance, or 100% on-site treatment and either re-use or infiltration of 100% of generated wastewater	
WE Credit 3	Water Use Reduction	45% reduction in potable water use	
Energy and Atmosphere			
EA Credit 1	Optimize Energy Performance	46% energy cost savings	
EA Credit 2	On-site Renewable Energy	15% on-site renewable energy	
EA Credit 3	Enhanced Commissioning	Comprehensive envelope commissioning	
EA Credit 6	Green power	100% purchase of renewable energy	
Material and Resources			
MR Credit 2	Construction Waste Management	Diverting 95% or more total construction waste	
MR Credit 3	Material Reuse	15% material reuse	
MR Credit 4	Recycled Content	30% total recycled content	
MR Credit 5	Regional Materials	30% or more regionally harvested, extracted, and manufactured materials	
MR Credit 6	Rapidly Renewable Materials	5% rapidly renewable materials	
Indoor Environmental Quality			
IEQ Credit 8	Daylight and Views	95% daylight 90% views occupied space	

RP CREDIT 1: REGIONAL PRIORITY 1–4 POINTS

Intent

To provide an incentive for the achievement of credits that address geographically specific environmental priorities.

Requirements

Earn 1-4 of the 6 Regional Priority credits identified by the USGBC regional councils and chapters as having environmental importance for a project's region. A database of Regional Priority credits and their geographic applicability is available on the USGBC Web site, http://www.usgbc.org.

One point is awarded for each Regional Priority credit achieved; no more than four credits identified as Regional Priority credits may be earned. Projects outside of the U.S. are not eligible for Regional Priority credits.

Potential Technologies and Strategies

Determine and pursue the prioritized credits for the project location.
The concept of Regional Priority Credits was introduced in the LEED 2009 rating systems to incentivize the achievement of credits that address geographically specific environmental priorities. RPCs are not new LEED credits, but instead are existing credits that USGBC chapters and regional councils have designated as being particularly important for their areas. The incentive to achieve the credits is in the form of a bonus point. If an RPC is earned, then a bonus point is awarded to the project's total points.

Each specific area – referenced by zip code – has six RPCs per rating system. A project may earn up to four bonus points as a result of earning RPCs, with one bonus point earned per RPC.

The Regional Priority Credits for this zip code are:

SS credit 1 – Site Selection
SS credit 4.1 – Alternative Transportation – public transportation access
SS Credit 6.2 – Stormwater Design – Quality Control
WE Credit 1 – Water Efficient Landscaping – Option 1 – reduce water use by 50%
EA credit 1 – Optimize Energy Performance – reduce by 16% for existing building
IEQ credit 8.1 – Daylight and Views – daylight

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APPENDIX D: CHARRETTE GROUPS LEED SCORE CARDS

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APPENDIX D: CHARRETTE GROUPS LEED SCORE CARDS

GROUP 1

LEED 2009 for New Construction and Major Renovations Project Checklist

Sustainable Sites

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Construction Activity – Pollution Prevention	Required	X	N/A	N/A	
Credit 1	Site Selection	1	1	N/A	N/A	
Credit 2	Development Diversity and Community Connection	5	0	N/A	N/A	
Credit 3	Brownfield Development	1	0	N/A	N/A	
Credit 4.1	Alternative Transportation – Public Transportation	6	0			Check this, may apply
Credit 4.2	Alternative Transportation – Bicycle Storage and Changing Room	1	1	0		
Credit 4.3	Alternative Transportation – Low-emitting and Fuel-efficient Vehicles	3	3	0		
Credit 4.4	Alternative Transportation – Parking Capacity	2	2	0		
Credit 5.1	Site Development – Protect or Restore Habitat	1	1	0		
Credit 5.2	Site Development – Maximize Open Space	1	1	0		
Credit 6.1	Stormwater – Quantity Control	1				
Credit 6.2	Stormwater – Quality Control	1				
Credit 7.1	Heat Island – Nonroof	1				
Credit 7.2	Heat Island – Roof	1		1		
Credit 8	Light Pollution Reduction	1			N/A	
	Total	26	9	1		

Water Efficiency

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Water-use Reduction	Required	X	N/A	N/A	
Credit 1	Water Efficient Landscaping	2-4	4	0	N/A	
Credit 2	Innovative Wastewater Technologies	2				
Credit 3	Water Use Reduction	2-4				
	Total	10	4			

Energy and Atmosphere

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Fundamental Commissioning of Building Energy Systems	Required	X	N/A	N/A	
Prerequisite	Minimum Energy Performance	Required	X	N/A	N/A	
Prerequisite	Fundamental Refrigerant Management	Required	X	N/A	N/A	
Credit 1	Optimizing Energy Performance	1-19	5	5		
Credit 2	On-site Renewable Energy	1-7		2		
Credit 3	Enhanced Commissioning	2		2		
Credit 4	Enhanced Refrigeration Management	2		2	N/A	
Credit 5	Measurement and Verification	3		3	N/A	
Credit 6	Green Power	2	2			
	Total	35	7	14		

Materials and Resources

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Storage and Collection of Recyclables	Required	X	N/A	N/A	
Credit 1.1	Building Reuse – Maintain Existing Walls, Floors and Roof	1-3	3		N/A	
Credit 1.2	Building Reuse – Maintain Existing Interior Nonstructural Elements	1	0		N/A	
Credit 2	Construction Waste Management	1-2	1	1		
Credit 3	Material Reuse	1-2	1	1		
Credit 4	Recycled Content	1-2	1	1		
Credit 5	Regional Materials	1-2	1	1		
Credit 6	Rapidly Renewable Materials	1	1	-1		
Credit 7	Certifiable Wood	1	1	-1	N/A	
	Total	14	9	2		

Indoor Environmental Quality

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Minimum Indoor Air Quality Performance	Required	X	N/A	N/A	
Prerequisite	Environmental Tobacco Smoke Control	Required	X	N/A	N/A	
Credit 1	Outdoor Air Delivery Monitoring	1	1		N/A	
Credit 2	Increased Ventilation	1			N/A	
Credit 3.1	Construction Indoor Air Quality Management Plan – During Construction	1	1		N/A	
Credit 3.2	Construction Indoor Air Quality Management Plan – Before Occupancy	1	1		N/A	
Credit 4.1	Low-Emitting Materials – Adhesives and Sealants	1	1		N/A	
Credit 4.2	Low-Emitting Materials – Paints and Coatings	1	1		N/A	
Credit 4.3	Low-Emitting Materials – Flooring Systems	1	1		N/A	
Credit 4.4	Low-Emitting Materials – Composite Wood and Agrifiber Products	1	1		N/A	
Credit 5	Indoor Chemical and Pollutant Source Control	1			N/A	
Credit 6.1	Controllability of Systems – Lighting	1			N/A	
Credit 6.2	Controllability of Systems – Thermal Comfort	1		1	N/A	
Credit 7.1	Thermal Comfort – Design	1		1	N/A	
Credit 7.2	Thermal Comfort – Verification	1			N/A	
Credit 8.1	Daylight and Views – Daylight	1		1		
Credit 8.2	Daylight and Views – Views	1				
	Total	15	7	3		

Innovation in Design 6 Possible Points

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Strategy
Credit 1	Historic Preservation	1		1	
Credit 1		1			
Credit 1		1			
Credit 1		1			
Credit 1		1			
Credit 2	LEED Accredited Professional	1	1		
	Total	6	1	1	

Regional Priority

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Strategy
Credit 1	SS Credit 1 – Site Selection	1	1	N/A	
Credit 2	WE Credit 1 – Water-Efficient Landscaping	1	1	N/A	
Credit 3		1			
Credit 4		1			
	Total	4	2		

Group 2

LEED 2009 for New Construction and Major Renovations Project Checklist

Score Card

	Credit Area	Possible Points	Points Achieved	Additional Points Targeted
	Sustainable Sites	26	9	1
	Water Efficiency	10	4	0
	Energy and Atmosphere	35	7	14
	Material and Resources	14	9	0
	Indoor Environmental Quality	15	7	3
	Innovation in Design	6	1	1
	Regional Priority	4	2	
	Totals	110	39	19
	Grand Total Targeted	58		

100 Base Points; Six Possible Innovation in Design and Four Regional Priority Points

- Certified 40–49 points
- Silver 50–59 points
- Gold 60–79 points
- Platinum 80 points and above

Sustainable Sites

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Construction Activity – Pollution Prevention	Required	X	N/A	N/A	
Credit 1	Site Selection	1	1	N/A	N/A	
Credit 2	Development Diversity and Community Connection	5	0	N/A	N/A	
Credit 3	Brownfield Development	1	0	N/A	N/A	
Credit 4.1	Alternative Transportation – Public Transportation	6	0			Check this, may apply
Credit 4.2	Alternative Transportation – Bicycle Storage and Changing Room	1	1	0		
Credit 4.3	Alternative Transportation – Low-emitting and Fuel-efficient Vehicles	3	3	0		
Credit 4.4	Alternative Transportation – Parking Capacity	2	2	0		
Credit 5.1	Site Development – Protect or Restore Habitat	1	1	0		
Credit 5.2	Site Development – Maximize Open Space	1	1	0		
Credit 6.1	Stormwater – Quantity Control	1		1		
Credit 6.2	Stormwater – Quality Control	1				
Credit 7.1	Heat Island – Nonroof	1		1		
Credit 7.2	Heat Island - Roof	1		1		
Credit 8	Light Pollution Reduction	1			N/A	
	Total	26	9	3		

Water Efficiency

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Water-use Reduction	Required	X	N/A	N/A	
Credit 1	Water-efficient Landscaping	2-4	4	0	N/A	
Credit 2	Innovative Wastewater Technologies	2		1		Would consider waterless urinal – may be a tough sell
Credit 3	Water Use Reduction	2-4		2		
	Total	10	4	3		

Energy and Atmosphere

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Fundamental Commissioning of Building Energy Systems	Required	X	N/A	N/A	
Prerequisite	Minimum Energy Performance	Required	X	N/A	N/A	
Prerequisite	Fundamental Refrigerant Management	Required	X	N/A	N/A	
Credit 1	Optimizing Energy Performance	1-19	5	5		
Credit 2	On-site Renewable Energy	1-7		3		
Credit 3	Enhanced Commissioning	2		2		
Credit 4	Enhanced Refrigeration Management	2		2	N/A	
Credit 5	Measurement and Verification	3		3	N/A	
Credit 6	Green Power	2	2			
	Total	35	7	15		

Materials and Resources

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Storage and Collection of Recyclables	Required	X	N/A	N/A	
Credit 1.1	Building Reuse – Maintain Existing Walls, Floors, and Roof	1-3	3		N/A	
Credit 1.2	Building Reuse – Maintain Existing Interior Nonstructural Elements	1	0		N/A	
Credit 2	Construction Waste Management	1-2	1	1		
Credit 3	Material Reuse	1-2	1	1		
Credit 4	Recycled Content	1-2	1	1		
Credit 5	Regional Materials	1-2	1	1		
Credit 6	Rapidly Renewable Materials	1	1	-1		
Credit 7	Certifiable Wood	1	1	-1	N/A	
	Total	14	9	2		

Indoor Environmental Quality

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Exemplary Points Available	Strategy
Prerequisite	Minimum Indoor Air Quality Performance	Required	X	N/A	N/A	
Prerequisite	Environmental Tobacco Smoke Control	Required	X	N/A	N/A	
Credit 1	Outdoor Air Delivery Monitoring	1	1		N/A	
Credit 2	Increased Ventilation	1			N/A	
Credit 3.1	Construction Indoor Air Quality Management Plan – During Construction	1	1		N/A	
Credit 3.2	Construction Indoor Air Quality Management Plan – Before Occupancy	1	1		N/A	
Credit 4.1	Low-emitting Materials – Adhesives and Sealants	1	1		N/A	
Credit 4.2	Low-emitting Materials – Paints and Coatings	1	1		N/A	
Credit 4.3	Low-emitting Materials – Flooring Systems	1	1		N/A	
Credit 4.4	Low-emitting Materials – Composite Wood and Agrifiber Products	1	1		N/A	
Credit 5	Indoor Chemical and Pollutant Source Control	1			N/A	
Credit 6.1	Controllability of Systems – Lighting	1		1	N/A	
Credit 6.2	Controllability of Systems – Thermal Comfort	1		1	N/A	
Credit 7.1	Thermal Comfort – Design	1		1	N/A	
Credit 7.2	Thermal Comfort – Verification	1			N/A	
Credit 8.1	Daylight and Views – Daylight	1		1		
Credit 8.2	Daylight and Views – Views	1				
	Total	15	7	4		

Innovation in Design 6 Possible Points

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Strategy
Credit 1	Historic preservation	1		1	
Credit 1		1			
Credit 1		1			
Credit 1		1			
Credit 1		1			
Credit 2	LEED Accredited Professional	1	1		
	Total	6	1	1	

Regional Priority

Credit No.	Credit Category	Possible Points	Points Achieved	Additional Points Targeted	Strategy
Credit 1	SS Credit 1 – Site Selection	1	1	N/A	
Credit 2	WE Credit 1 – Water Efficient Landscaping	1	1	N/A	
Credit 3		1			
Credit 4		1			
	Total	4	2		

Score Card

	Credit Area	Possible Points	Points Achieved	Additional Points Targeted
	Sustainable Sites	26	9	3
	Water Efficiency	10	4	3
	Energy and Atmosphere	35	7	15
	Material and Resources	14	9	2
	Indoor Environmental Quality	15	7	4
	Innovation in Design	6	1	1
	Regional Priority	4	2	
	Totals	110	39	28
	Grand Total Targeted	67		

100 Base Points; Six Possible Innovation in Design and Four Regional Priority Points

- Certified 40–49 points
- Silver 50–59 points
- Gold 60–79 points
- Platinum 80 points and above

APPENDIX E: GREEN PRODUCTS RESEARCH

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APPENDIX E: GREEN PRODUCTS RESEARCH

This appendix includes a discussion of costs associated with each LEED credit. Prices were valid as of November 2009. Some costs are too variable to estimate without designs and specifications. Local products and services providers are listed where appropriate.

SUSTAINABLE SITES

SS Prerequisite 1: Construction Activity Pollution Prevention

Costs would be included in design and construction costs.

SS Credit 1: Site Selection

This site does meet this requirement, although no costs would be associated with this credit.

SS Credit 2: Development Density and Community Connectivity

This site does not meet this requirement, although no costs would be associated with this credit.

SS Credit 3: Brownfield Redevelopment

This site has been tested and is not contaminated, nor does it meet the definition of a brownfield. No cleanup or remediation costs are assumed.

SS Credit 4.1: Alternative Transportation—Public Transportation Access

This project site is not within 0.25 mile of one or more stops for two or more bus lines, although no costs would be associated with this credit.

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

This credit is estimated at $2,000.

Assumption:
FTE 250 x 0.5% = 125 x .05 bike spaces = 10 bike racks
FTE 250 x 0.5% = 125 x .005 showers = 1 shower

10-Bike Heavy-Duty Double-faced Bike Rack, 5' L	ATD American 135 Greenwood Avenue Wyncote, PA 19095-1396 $314.00
18 Bike Capacity Galvanized	Belson Outdoors, Inc. 111 North River Road North Aurora, IL 60542 Phone: 630.897.8489 Fax: 630.897.0573 Toll Free: 800.323.5664 $539.00
Allen AL206D Double-sided 12-Bike Commercial Parking Rack	Net City Shops 14505 21st Ave N Suite 232 Plymouth, MN 55447 $349.00

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

Costs would be variable, but assumed to be comparable to standard vehicles. Signage for parking would costs about $300.

SS Credit 4.4: Alternative Transportation—Parking Capacity

Already ample parking available on Stout Field, no new parking will be constructed.

SS Credit 5.1: Site Development—Protect or Restore Habitat

The project area is 2.0 acres
The existing green space is 0.9 acre
The building footprint is 0.32 acre

2.0 acres – 0.32 acre (building footprint) = 1.68 acres. 50% = 0.84 acre
20% of total site is 0.4 acre.

Amble habitat and green space, no additional habitat is required.

SS Credit 5.2: Site Development—Maximize Open Space
1 Point

The project area is 2.0 acres
The existing green space is 0.9 acre
The building footprint is 0.32 acre

Already sufficient open space to meet this requirement.

SS Credit 6.1: Stormwater Design—Quantity Control

Costs would be included in design and construction costs.

SS Credit 6.2: Stormwater Design—Quality Control

It was decided during the charette not to remove existing paving or other impervious surfaces in order to "buy" points for LEED. This credit not pursued. If a geothermal system is constructed and were to be located under the existing parking lot, resurfacing parking lot in porous material would be considered.

SS Credit 7.1: Heat Island Effect—Nonroof

Costs would be variable depending on strategy implemented. It is estimated at $5,000.

SS Credit 7.2: Heat Island Effect—Roof

Costs would be variable depending on strategy implemented. A new white roof is estimated at $6,500.00.

SS Credit 8: Light Pollution Reduction

This credit was deemed not appropriate for Stout Field. Military security needs would be implemented.

WATER EFFICIENCY

Toilet Replacements:

Kohler Wellcomme toilet bowl	Low Flow	$176.00
American Standard Madera Flowise Toilet Bowl	Low Flow	$183.00

Urinals Replacements:

American Standard Maybrook Urinal Bowl	Low Flow	$175.00
American Standard Albrook Urinal Bowl	Low Flow	$306.00

Recycle toilet bowls and urinals by refitting them with low flow flush valves:

American Standard .07 urinal valve	Low Flow. 7 gpf	$397.00
American Standard Trimbrook .085 Urinal Valve	Low Flow. 85 gpf	$409.00
Moen Commercial Toilet Flush Valve	Low Flow .1.6 gpf	$417.00
Sloan 186-ES-S Auto-Sensor Flush Master	Low Flow. 7 gpf	$441.00

Dual Flush Toilets:

American Standard Dual Flush Elongated Toilet	Low Flow .08 to1.6 gpf	$429.00
Caroma Caravelle One-piece Dual Flush Toilet	Low Flow .08 to 1.6 gpf	$412.00

Waterless Urinals:

Kohler Steward Waterless Urinal	Waterless	$489.00
Duravit Architec Waterless Urinal	Waterless	$617.00
American Standard Flowise Waterless Large Urinal	Waterless	$351.00
Kohler Sealing Liquid	Waterless maintenance fluid 1gal	$92.00

Lavatory Faucets:

Delta Faucet Single Handle Lavatory Faucet 500wf	Low Flow	$68.50
Delta Faucet Double Handle Lavatory Faucet S 2520-mpu	Low Flow	$62.14
Kohler Center Set Lavatory Faucet Only Base Faucet K-7404-K-CP	Low Flow	$ 65.55

Costs of low flow fixtures are comparable to regular flow fixtures.

WE Credit 1: Water Efficient Landscaping
Current landscaping is not irrigated; it will not be changed to species requiring watering.

WE Credit 2: Innovative Wastewater Technologies
Waterless urinals are approximately $350.00 more expensive than water urinals. Waterless urinals also require sealing liquid averaging $1,104.00/year. This is estimated to be $5,000.00.
Waterless urinals:

Kohler Steward Waterless Urinal	Waterless	$489.00
Duravit Architec Waterless Urinal	Waterless	$617.00
American Standard Flowise Waterless Large Urinal	Waterless	$351.00
Kohler Sealing Liquid	Waterless maintenance fluid 1gal	$92.00

WE Credit 3: Water Use Reduction
Costs itemized above.

ENERGY AND ATMOSPHERE

EA Prerequisite 1: Fundamental Commissioning of Building Energy Systems
Costs included in design and construction.

EA Prerequisite 2: Minimum Energy Performance
Costs included in design and construction.

EA Prerequisite 3: Fundamental Refrigerant Management
Costs included in design and construction.

EA Credit 1: Optimize Energy Performance
As part of the renovation program, the HVAC system would be replaced, estimated at $10,000 to increase energy performance.

EA Credit 2: On-site Renewable Energy
Costs are variable, but adequate solar hot water system to achieve credit estimated at $8,000.

EA Credit 3: Enhanced Commissioning
Costs for enhanced commissioning estimated at $24,000.

EA Credit 4: Enhanced Refrigerant Management
Additional costs are not anticipated for this credit.

EA Credit 5: Measurement and Verification
Costs for this credit are estimated at $5,000.

EA Credit 6: Green Power
Costs for this credit are estimated at $4,000.

MATERIALS AND RESOURCES

MR Prerequisite 1: Storage and Collection of Recyclables

New Home 60L-2 Section Recycle Bin	Walmart	$ 109.96
Rubbermaid Computer Paper Recycle Bin	12.5 gal.	$16.99
Rubbermaid Square Brute Recycle Bin	50.0 gal.	$99.99
Rubbermaid Can Recycle Bin Top		$29.99

Recycle Centers within Five Miles of Stout Field

On-site Recycle Location: Stout Field Stout Field Drive Indianapolis, Indiana 46241	Paper, Cans, and Cardboard
Marsh Supermarket 3633 Kentucky Avenue Indianapolis, Indiana 46241	Paper, Cardboard, and Cans
Farnsworth Metal Recycling 3602 Farnsworth Street Indianapolis, Indiana 46421	Metal, Cans

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

This credit is not anticipated to result in additional costs.

MR Credit 1.2: Building Reuse—Maintain Interior Nonstructural Elements

This credit is not considered feasible.

MR Credit 2: Construction Waste Management

This costs is variable, but is estimated at $15,000. Costs are generally associated with additional labor to sort materials and on-site storage and management. Some materials may be able to be sold depending on the market conditions.

Construction Waste Recycles Centers in Indianapolis:

Habitat for Humanity ReStore
Address: 1011 East 22nd Street
Drop-off times: Tuesday – Friday, 9:00 a.m. – 2:00 p.m.
Phone: 317.921.2121, ext. 119
Web: www.indyhabitat.org
What's accepted: Aluminum cans, carpets, ceramic tile, computers, gypsum drywall, construction materials, electronics, linoleum, porcelain products, appliances, roofing materials, and more.

Farnsworth Metal Recycling
Address: 3602 Farnsworth Street
Drop-off times: Monday – Friday, 8:00 a.m. – 4:30 p.m.; Saturday, 8:00 – 11:00 a.m.
Phone: 317.481.8501
what's accepted: Aerosol cans, aluminum cans, aluminum foil, metals, large appliances, tin, and steel cans.

RecycleForce, LLC
Address: 754 North Sherman Drive, Suite 220
Drop-off times: Monday – Friday, 8:30 a.m. – 5:00 p.m.
Phone: 317.532.1367
Web: www.recycleindy.com
What's accepted: CPUs, laptops, monitors, keyboards, printers, peripherals, TVs.

Ski Landscape Corporation
Address: 9786 East 56th Street
Phone: 317.897.5885
Web: www.skilandscape.com
What's accepted: tree limbs, leaves, logs, soil.

Circle City Metal Recycling
Address: 1428 West Henry Street
Phone: 317.632.4320
Web: www.ccmr.bz
What's accepted: CCMR accepts and pays cash for most household, commercial, and industrial recyclables. Metals: aluminum, brass, copper, steel, stainless steel, tool steel, insulated wire, cast iron, transformers. Batteries: lead acid, lithium, nicad. Electronics: computers, copiers, data cable, printed circuit boards, printers, switch gear. Polymers: post-industrial plastic and rubber.

Construction Haulers and Recyclers:
This company can sort and recycle the majority of construction waste for your project, either on-site in separate dumpsters / roll-off containers or at the PRO Waste C/D Processing Facility in Indianapolis.

Pro Waste Systems
829 South East Street
Indianapolis, IN 46225
Phone: 317.822.4776
Fax: 317.822.4775
Recovery Operations:
905 West Troy
Indianapolis, IN 46225
Business Hours:
Dispatch: 24 hours
Office: 8:00 a.m. to 5:00 p.m.

Indiana Recycling Co.
1500 North Delaware Street
Indianapolis, IN 46202
317.632.5915

Daves Trucking Co., Inc.
1007 Earhart Street
Indianapolis, IN
317.353.9566
Commercial Services Construction garbage collection local trucking Residential Services trucking Waste Reduction Disposal & Recycling Service

MR Credit 3: Materials Reuse
This credit is not considered feasible.

MR Credit 4: Recycled Content
Costs for using recycled content materials are estimated at $1,000. Many materials are now comparable in price to products made of virgin materials.

Suppliers

Firestone Building Products Company, LLC
250 West 96th Street
Indianapolis, IN 46260
Business mailing address:
250 West 96th Street
Indianapolis, IN 46260
Business Store Address
3525 South Arlington Avenue
Beech Grove, IN 46203

Photovoltaic Roofing, Garden Roofing, Reflective Membranes and Accessories, Recycled Content and Recyclable Materials, RubberGard EPDM Systems, UltraPly TPO Systems, Metal Systems, Asphalt Systems.

Recycling Market Development Program
100 North Senate Avenue, MC 64-02
Indianapolis, IN 46204
Toll Free: 1.800.988.7901
Fax: 317.233.5627
Email: recycle@idem.IN.gov
Web: www.recycle.IN.gov

Elmwood Reclaimed Timber
PO Box 10750
Kansas City, MO 64188-0750
Phone: 816.532.0300
Toll Free: 800.705.0705
Recycled wood products and flooring

Temple-Inland
3508 Harlington Lane
Richardson, TX 75082
glennmiller@templeinland.com
www.templeinland.com/buildingproducts/
972.235.4448 (main)
95% recycled content mold-resistant gypsum wallboard. Available fire-rated.

USG Corporation
550 West Adams Street
Department 188
Chicago, Illinois 60661
United States
Phone: 312.436.4000
Fax: 312.606.3700
95% recycled content mold-resistant gypsum wallboard. Available fire-rated.

Andersen Corporation
100 Fourth Avenue North
Bayport, MN 55003-1096
Windows made from recycled content.

MR Credit 5: Regional Materials

Local Green Building Products
(Within 500 Miles of Building 5 Stout Field, 202 South Holt Road. Indianapolis, IN 46241)

Composite Windows
High Performance Fiberglass Windows by Comfort Line, Ltd.
5500 Enterprise Blvd, Toledo, OH 43612
Phone: 800.522.4999 / 419.729.8520

Fiberglass Building Insulation
Owens Corning
1 Owens Corning Pkwy, Toledo, OH 43659

Styrofoam High Performance Underlayment
Dow Chemical Company, Styrofoam
200 Larkin Center, Midland, MI 48674
Phone: 800.441.4369 / 989.636.1000

Thermafiber Mineral Wool Insulation Products
Thermafiber, Inc.
3711 West Mill Street, Wabash, IN 46992
Phone: 888.834.2371 / 260.563.2111
www.thermafiber.com

Air Handling Insulation Products
Knauf Insulation
One Knauf Drive, Shelbyville, IN 46176
Phone: 800.825.4434 / 317.398.4434
www.knaufusa.com

Loosefill and Stabilized Cellulose Insulation
Applegate Insulation
Manufacturing
1000 Highview Drive, Webberville, MI 48892
Phone: 800.627.7536 / 517.521.3545
www.applegateinsulation.com

Cellulose Insulation
Advanced Fiber Technology, Inc.
100 Crossroads Blvd, Bucyrus, OH 44820
Phone: 419.562.1337
www.advancedfiber.com

Structural Insulated Panels
Pacemaker Building Systems
126 New Pace Road, P.O. Box 279, Newcomerstown, OH 43832
Phone: 800.551.9799 / 740.498.4181
www.pacemakerbuildingsystems.com

Structural Insulated Panels
PORTER Corp.
4240 North 136th Avenue, Holland, MI 49424
Phone: 800.354.7721, 616.399.1963
www.portersips.com

Acoustical Underlayment
Knight-Celotex
One Northfield Plaza, Northfield, IL 60093
Phone: 847.716.8030
www.knightcelotex.com

Backing Boards and Underlayments
BetterBoard Tile Backer
Curb Appeal Materials, LTD
3824 North Johnsburg Road, McHenry, IL 60050
Phone: 815.344.7926
www.vortexcomposites.com

Fiberock Brand Aqua Tough Panels
USG Corporation
555 West Adams Street, Chicago, IL 60661
Phone: 800.874.4968 / 312.436.4000
www.usg.com

Bamboo Flooring
GreenFloors Bamboo Flooring
GreenFloors
3170 Draper Drive, Fairfax, VA 22031
Phone: 703.352.8300
www.greenfloors.com

Brick Flooring Thin-Sliced Salvaged Chicago Brick
Vintage Brick Salvage LLC
1303 Harrison Avenue, Rockford, IL 61104
Phone: 800.846.8243 / 847.714.3652
www.bricksalvage.com

Carpet Cushion
AcoustiCORK
Amorim Industrial Solutions
26112 110th Street, P.O. Box 25, Trevor, WI 53179
Phone: 800.255.2675 / 262.862.2311
www.acousticorkusa.com

UnderFleece
Appleseed Wool Corp.
55 Bell Street, Plymouth, OH 44865
Phone: 800.881.9665 / 419.687.9665
www.appleseedwoolcorp.com

Carpet Recycling
OPT3 by DPM Enterprises
128 Regional Park Drive, Kingsport, TN 37660
Phone: 423.349.4129
www.dpmenterprises.net

Carpet Tile
FLOR Terra with Ingeo PLA Fiber
FLOR, Inc.
116 N. York Street, Suite 300, Elmhurst, IL 60126
Phone: 866.281.3567 / 630.516.4250
www.flor.com

Ceramic Tile Terra Classic and Terra Traffic
Terra Green Ceramics
1650 Progress Drive, Richmond, IN 47374
Phone: 765.935.4760
www.terragreenceramics.com

Cork Flooring
Cork Mosaic Floor Tile
Habitus
166 East 108th Street, New York NY 10029
Phone: 212.426.5500
www.habitusnyc.com

Expanko Cork Tiles
Expanko Cork Company
1129 West Lincoln Hwy, Coatesville, PA 19320
Phone: 800.345.6202 / 610.380.0300

Flooring Adhesives
#965 Flooring and Tread Adhesive
Johnsonite
16910 Munn Road, Chagrin Falls, OH 44023
800.899.8916 / 440.543.8916
www.johnsonite.com

Safe-Set Adhesives Chicago Adhesive Products Co.
1105 South Frontenac Street, Aurora, IL 60504
Phone: 800.621.0220 / 630.679.9100
www.chapco-adhesive.com

Flooring Underlayment
AcoustiCORK
Amorim Industrial Solutions
26112 110th Street, P.O. Box 25, Trevor, WI 53179
Phone: 800.255.2675 / 262.862.2311
www.acousticorkusa.com

Reclaimed Wood Flooring
Appalachian Woods Appalachian Woods, LLC
1240 Cold Springs Road, Stuarts Draft, VA 24477
Phone: 800.333.7610 / 540.337.1801
www.appalachianwoods.com

Heartwood Reclaimed-Wood Flooring
Heartwood Industries
3658 State Road 1414, Hartford, KY 42347
Phone: 270.298.0084
www.whiskeywood.com

Reclaimed-Wood Building Products
J. Hoffman Lumber Co.
1330 East State Street, Sycamore, IL 60178
Phone: 815.899.2260
www.hoffmanlumberco.com

Resilient Sheet Flooring
Johnsonite Linoleum xf,
Johnsonite
16910 Munn Road, Chagrin Falls, OH 44023
Phone: 800.899.8916 / 440.543.8916
www.johnsonite.com

Sheet Carpet
Wool and Cotton Carpet
Carousel Carpets
3315 Superior Lane, Bowie, MD 20715
Phone: 301.262.2650
www.carouselcarpets.com

Acoustical Ceilings
Acoustical Ceiling Panels and Tiles
USG Corporation
555 West Adams Street, Chicago, IL 60661
Phone: 800.874.4968 / 312.436.4000
www.usg.com

Mineral Fiber and Glass Based Drop-In Ceiling Tile
Armstrong World Industries, Inc.
2500 Columbia Avenue (17603), P.O. Box 3001, Lancaster, PA 17604
Phone: 877.276.7876 / 717.397.0611
www.armstrong.com

Acoustical Wall Finishes
BASWAphon Acoustic Insulation
Sound Solutions Services, LLC
3900 Ben Hur Avenue, Suite 10, Willoughby, OH 44094
Phone: 440.951.6022
www.baswaphonusa.com

Gypsum Board
Fiberock Brand Aqua Tough Panels
USG Corporation
555 West Adams Street, Chicago, IL 60661
Phone: 800.874.4968 / 312.436.4000
www.usg.com

Sheetrock Brand Gypsum Panels by USG Corporation
555 West Adams Street, Chicago, IL 60661
Phone: 800.874.4968, 312.436.4000
www.usg.com

Residential Cabinetry
Green Leaf Cabinetry
Green Leaf Cabinetry, LLC
P.O. Box 110875, Cleveland, OH 44111

Caulk Joint Sealants
Liquid Nails Brand Supercaulk and Painter's Caulk
Macco Adhesives
15885 West Sprague Road, Strongsville, OH 44136
Phone: 800.634.0015 / 440.297.7304
www.liquidnails.com

Quick Shield VOC-Free Sealant
Geocel Corporation
P.O. Box 398, Elkhart, IN 46515
Phone: 800.348.7615 / 574.264.0645

Interior Paints
Devoe Wonder Pure, Dulux LifeMaster, Prep & Prime
ICI Paints
15885 West Sprague Road, Strongsville, OH 44136
Phone: 800.984.5444 / 216.344.8000
www.iciduluxpaints.com

Harmony Interior Latex Coating
The Sherwin-Williams Company Stores Group
101 Prospect Avenue, Cleveland, OH 44115
Phone: 800.524.5979 / 216.566.2000
www.sherwin-williams.com

Mastic Removers
BEAN-e-doo Mastic Removers
Franmar Chemical, Inc.
P.O. Box 5565, Bloomington, IL 61702
Phone: 800.538.5069 / 309.452.7526
www.franmar.com

Paint Removers
Soy-Gel by Franmar Chemical, Inc.
P.O. Box 5565, Bloomington, IL 61702
Phone: 800.538.5069 / 309.452.7526
www.franmar.com

Air Outlets and Inlets
Fresh 80 and Reton 80 Passive Air Inlets
Therma-Stor LLC
P.O. Box 8680, Madison, WI 53708
Phone: 800.533.7533 / 608.222.5301
www.thermastor.com

Trickle Ventilators
Titon, Inc.
P.O. Box 241, Granger, IN 46530
Phone: 572.271.9699
www.titon.com

Air-to-Air Energy Recovery Ventilation
Aprilaire Energy Recovery Ventilation
Aprilaire
1015 East Washington Avenue, P.O. Box 1467
Madison, WI 53701
Phone: 800.334.6011 / 608.257.8801
www.aprilaire.com

Furnaces
Encore NC 1450 by Vermont Castings
1000 East Market Street, Huntington, IN 46750
Phone: 800.227.8683
www.vermontcastings.com

Plus 90 High-Efficiency Furnaces by Bryant Heating & Cooling Systems
7310 West Morris Street, Indianapolis, IN 46231
Phone: 800.428.4326 / 317.243.0851
www.bryant.com

Heat Pumps
Ground-Source Heat Pumps by WaterFurnace International, Inc.
900 Conservation Way, Fort Wayne, IN 46809
Phone: 800.222.5667 / 260.478.5667
www.waterfurnace.com

Quantum Plus 698b Heat Pump by Bryant Heating & Cooling Systems
7310 West Morris Street, Indianapolis, IN 46231
Phone: 800.428.4326 / 317.243.0851
www.bryant.com

Residential Faucets, Showerheads, and Controls
Water-Efficient Showerheads
Delta Faucet Company
55 East 111th Street, P.O. Box 40980, Indianapolis, IN 46280
Phone: 800.345.3358 / 317.848.1812
www.deltafaucet.com

Sanitary Waste and Vent Pumping
Industry Representation by National Clay Pipe Institute
P.O. Box 759, Lake Geneva, WI 53147
Phone: 620.248.9094
www.ncpi.org

Vitrified Clay Pipe by Superior Clay Corp
P.O. Box, Uhrichsville, OH 44683
Phone: 800.848.6166 / 740.922.4122
www.superiorclay.com

Vitrified Clay Pipe by The Logan Clay Products Co.
P.O. Box 698, Logan, OH 43138
Phone: 800.848.2141 / 740.385.2184
www.loganclaypipe.com

Photovoltaic Collectors
UNI-SOLAR PV Shingles and Standing Seam Panels
United Solar Ovonic LLC
3800 Lapeer Road, Auburn Hills, MI 48326
Phone: 800.843.3892 / 248.475.0100
www.uni-solar.com

Compact Fluorescent Lamps
Cold Cathode Specialty Lamps by Technical Consumer Products, Inc.
325 Campus Drive, Aurora, OH 44202
Phone: 800.324.1496
www.tcpi.com

Compact Fluorescent Lamps
U.S. WAY Building Systems
P.O. Box 10080, Chicago, IL 60610
Phone: 773.338.9688
www.uswaycorp.com

GE CFL and Induction Lamps
GE Lighting
1975 Noble Road, Nela Park, Cleveland, OH 44112
Phone: 800.255.1200 / 216.266.2121
www.gelighting.com

MR Credit 6: Rapidly Renewable Materials

This credit was deemed not applicable due to lack of material type to be used in building.

MR Credit 7: Certified Wood

This credit was deemed not applicable due to lack of wood to be used in building.

INDOOR ENVIRONMENTAL QUALITY

IE Q Prerequisite 1: Minimum Indoor Air Quality Performance

Costs to achieve this credit would be included in the design and construction costs.

IE Q Prerequisite 2: Environmental Tobacco Smoke (ETS) Control

This credit is not anticipated to add costs to the project.

IE Q Credit 1: Outdoor Air Delivery Monitoring

This credit is estimated at $5,000. A couple of monitors are listed below.

Telaire 7001 Carbon Dioxide Monitor CO_2 and Temperature Monitor	Portable	$450.00
GE Telaire Ventostat® 8000 Series CO_2 Transmitters	HVAC	$369.51

IE Q Credit 2: Increased Ventilation
This credit was determined not feasible.

IE Q Credit 3.1: Construction Indoor Air Quality Management Plan—During Construction
Costs to achieve this credit would be included in the design and construction costs.

IE Q Credit 3.2: Construction Indoor Air Quality Management Plan—Before Occupancy
Costs to achieve this credit would be included in the design and construction costs.

IE Q Credits 4.1 through 4.4: Low-Emitting Materials

- adhesives and sealants
- paints and coatings
- flooring systems
- composite wood and Agrifiber products

Basis for Cost Assumption – Nationwide, low-VOC material costs are typically comparable to other quality products.

IE Q Credit 5: Indoor Chemical and Pollutant Source Control

This credit was determined not to be feasible.

IE Q Credit 6.1: Controllability of Systems—Lighting

Costs to achieve this credit would be included in the design and construction costs. Additional costs is estimated at $5,000.

IE Q Credit 6.2: Controllability of Systems—Thermal Comfort

Costs to achieve this credit would be included in the design and construction costs. Additional costs is estimated at $5,000.

IE Q Credit 7.1: Thermal Comfort—Design

This credit was determined not to be feasible.

IE Q Credit 7.2: Thermal Comfort—Verification

This credit was determined not to be feasible.

IE Q Credit 8.1: Daylight and Views—Daylight

This credit was determined not to be feasible.

IE Q Credit 8.2: Daylight and Views—Views

Costs to achieve this credit would be included in the design and construction costs. The drop ceiling would be removed and a reflective ceiling treatment added.

APPENDIX F: PROJECT PRESENTATIONS

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APPENDIX F: PROJECT PRESENTATION

As part of this DoD Legacy Program project, a presentation was offered at Colorado Preservation, Inc., Saving Places 2010 Conference. Participants were able to receive LEED AP continuing education credits for attending this session. The following is the PowerPoint presentation.

Presentation Points

- Why we did this project
- Objectives and goals
- Background information
- How we did this project
- Results of the case study
- Epilogue

Department of Defense (DoD)

- DoD owns or manages over 340,000 buildings in the US and territories.
- By 2015, approximately 140,000 will reach the age of 50 years old.
- Buildings owned by the federal government that are 50 years of age or older are subject to requirements of the National Historic Preservation Act of 1966, as amended
- Why I did this project

Regulatory Overview

- **National Historic Preservation Act**
- **EO 13287: Preserve America**
- **EO 11593: Protection & Enhancement of the Cultural Environment**
- **SOI's Standards for the Treatment of Historic Properties**

Regulatory Overview (cont)

- **Energy Independence and Security Act of 2007 - reduce/eliminate fossil fuel usage**
- **EO 13327: Federal Real Property Asset Management – meet Sustainable goals**
- **EO 13423: Strengthening Federal Environmental, Energy, and Transportation Management – reduce energy and water consumption, sustainable practices**
- **2007 Defense Installations Strategic Plan – promote national security thru sustainability**

Regulatory Overview (cont)

- **Army Memorandum: Sustainable Design and Development Policy Update – SPiRiT to LEED Transition, 2006 – FY08 all vertical construction meet LEED silver**
- **Army Memorandum: Sustainable Design and Development Policy Update –Life Cycle Costs, 2007 – reduce energy consumption and cost of ownership, LEED Silver**
- **Unified Facilities Criteria, DoD Minimum Antiterrorism Standards for Buildings, UFC 4-010-01 2007 – minimize mass casualties**

Regulatory Summary

- Military must:
  - preserve and re-use historic buildings
  - reduce fossil-fuel energy use 55% by 2010 from a 2003 baseline
  - Design all military construction (MILCON) vertical construction projects to achieve LEED Silver
  - Meet ATFP requirements

Project Objectives & Goals

- to determine, through a case study, if it is feasible to renovate a DoD historic building to achieve LEED silver certification AND preserve the historic integrity of the building.
- to explore whether preservation, sustainability, and energy conservation goals/regulations could be achieved,
- And to understand the costs, benefits, and tradeoffs of doing so.

DoD Legacy Program

- Established in 1990 by Congress to provide financial assistance to DoD efforts to preserve natural and cultural heritage. The program assists DoD in protecting resources while supporting military readiness.

  stewardship, **leadership**, and **partnership**.

- Developed the proposal and put out a call for a sponsor

Building 5 – Stout Field

Building 5 History

- part of the large building plan for Stout Field under the National Defense Act in 1940–1941.
- State obtained a WPA grant for improvements to Stout Field including infrastructure , an administration building (Building 5) and a hangar (Building 9).
- WPA began construction in July 1941
- Designed by local architect John P. Parrish.
- U.S. government leased Stout Field in April 1942, buildings were completed by the spring of 1943.

Building 5

- facilities for enlisted men, including locker rooms, showers, classrooms, and recreation rooms., and visiting officers' dormitory
- Large bay -airplane repair shop and garage
- Weir Cook Airport (Civilian), which opened in 1931, confused pilots on where to land
- control tower moved from the field to the roof in February 1943 helped solve this problem; The tower also controlled the traffic light on Holt Road, east of Stout Field, to facilitate the takeoff and landing of B-25 bombers. When these aircraft were ready to take off or land the control tower stopped traffic along Holt Road

1956

Circa 2001

Character Defining Features

- The overall shape of building. A central core and control tower with symmetrical wings with horizontal massing and minimal horizontal elements (windows, railings, etc.).
- Exterior. Original floodlight on parapet, exterior concrete walls, original metal clad exterior doors, unobstructed view of front facade from pedestrian or vehicular access, "Administration" sign and clock, and a copper light fixture
- Control Tower. Gutter trough and downspouts, ladder and catwalk, concrete spanning slabs and wood-frame flooring system, original steel sash windows, metal cladding, wood paneling on interior walls and ceiling.

Character Defining Features

- Boiler room and basement. Concrete stairs from basement to first floor, metal catwalk and stair in boiler room, and deep foundation in mechanical basement.
- Bathrooms. Original floor and wall tile, and floor-mounted plumbing fixtures
- First Floor. Nonstructural frame and cinderblock walls, original metal clad interior doors, original interior wood doors, steel pan stair from first to second floor, concrete in vehicle and hangar bays, and the hangar bay space.

Character Defining Features

- Second Floor. Hangar bay space, nonstructural frame and cinderblock walls, original steel sash windows, original metal clad interior doors, original interior wood doors, steel pan stair from second to third floor, glazed tile walls in shower stalls , and original tile flooring in dormitory corridor
- Third & Fourth Floors. Nonstructural frame and cinderblock walls, original interior wood doors, original metal clad interior doors, and steel pan stair between floors.
- Roof. Decking and structural framing on main roof and accessory roof; decking and structural framing, gutter trough, downspouts, and planking on fourth floor roof; and flat nature of roof.

Methodology

- **LEED Strategy and Concepts Charrette**
  - Analysis possibility for achieving LEED silver
  - Determination LEED prerequisites and credits that can be achieved.
  - Additional strategies for achieving LEED points
  - Have no adverse effect
- **Feasibility Study**
  - provide recommendations for achieving LEED.
  - Cost comparison of "green" renovation v. conventional practices based on the credits to be achieved. (Costs of demolition and new construction comparisons.)

LEED Rating Systems

- New Construction
- Existing Building: Operation and Maintenance
- Core and Shell
- Schools
- Neighborhood Development
- Retail
- Healthcare
- Homes
- Commercial Interiors

LEED Systems (cont)

- LEED NC v. LEED EB
- LEED EB -implementing sustainable operations and maintenance practices.
- LEED - NC for both new buildings and major renovations of existing buildings.
- A major renovation = major HVAC renovation, significant envelope modifications, and major interior rehabilitation.

Building 5 -First Floor

Building 5 -Second Floor

Building 5 -Third FLoor

Building 5 South Elevation

Building 5 – West Elevation

Charrette

- Project Manager / Charrette Facilitator
- INARNG – Plant (Facility) Manager
- RQAW Corp. – Renovation/Architectural Design Team
- INARNG – Energy Manager
- INARNG – Project Manager / Facilities Engineering
- INARNG – Cultural Resources Manager / Legacy Project Sponsor
- RQAW Corp. – Renovation / Architectural Design Team
- Hardlines Design / Provide Expertise to Historic Buildings and LEED Strategies
- Indiana Division of Historic Preservation and Archaeology / SHPO
- Indiana Division of Historic Preservation and Archaeology / SHPO
- Indiana Chapter of USGBC Representative / Architect
- RTM Consultants, Inc. – Provided Building Codes Expertise (ADA/ABA)
- INARNG – Planning Office / GIS
- INARNG – Master Planner
- INARNG – ATFP Expert

Charrette (cont)

- The intent of the charrette was to:
  - discuss the construction program goals
  - ATFP, ADA/ABA requirements
  - discuss LEED certification and point system
  - define the historically significant, character-defining features
  - define "no adverse effect" determination under Section 106 (NHPA)
  - SOI's Standards for the Treatment of Historic Properties
  - develop a LEED credit-by-credit strategy for achieving silver AND preserving the historical integrity of the building

Building Program

- major interior renovation-Administration, Recruitment, Retention.
- Building 5 has 28,080 sq ft, and needed:
  - Offices/cubicle work spaces for 250 people; retain flexibility
  - records and general office storage
  - restrooms
  - conference rooms
  - small museum
  - mechanical, electrical, plumbing, comm systems -replaced
  - windows were replacements (ATFP)
  - roof needs to be replaced
  - meet required ADA/ABA

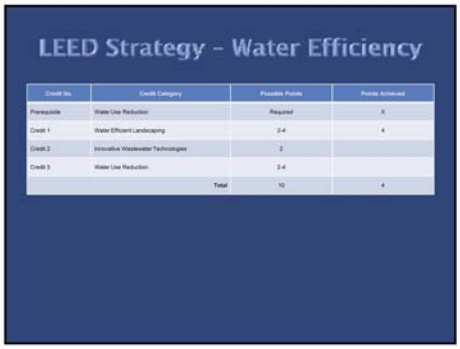
LEED Strategy

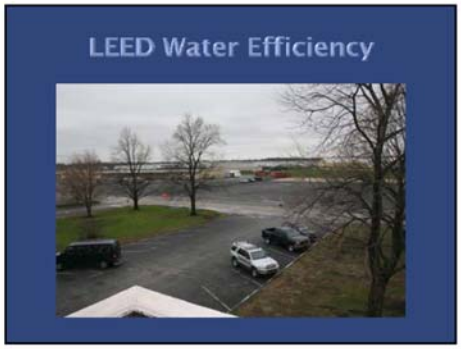
- LEED 2009 - NC:
  - Certified - 40–49 points
  - Silver - 50–59 points
  - Gold - 60–79 points
  - Platinum - 80 points and above

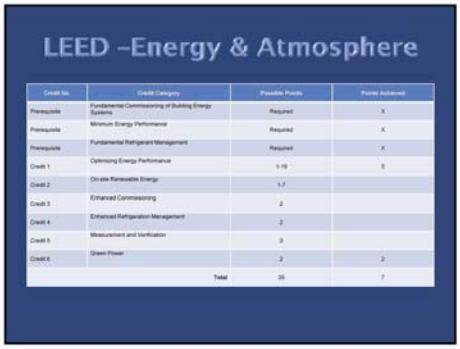
LEED Strategy – Sustainable Sites

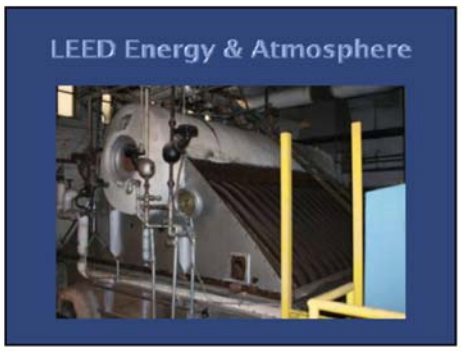
Credit No.	Credit Category	Possible Points	Points Achieved
Prerequisite	Construction Activity – Pollution Prevention	Required	X
Credit 1	Site Selection	1	1
Credit 2	Development Diversity and Community Connection	5	5
Credit 3	Brownfield Development	1	0
Credit 4.1	Alternative Transportation – Public Transportation	6	0
Credit 4.2	Alternative Transportation – Bicycle Storage and Changing Room	1	1
Credit 4.3	Alternative Transportation – Low-emitting and Fuel Efficient Vehicles	3	3
Credit 4.4	Alternative Transportation – Parking Capacity	2	2
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 – Quantity Control	1	
Credit 6.2	Stormwater – Quality Control	1	
Credit 7.1	Heat Island – Nonroof	1	
Credit 7.2	Heat Island – Roof	1	
Credit 8	Light Pollution Reduction	1	


LEED Sustainable Sites


LEED Strategy – Water Efficiency
Credit No.
Credit Category
Possible Points
Points Achieved
Prerequisite
Water Use Reduction
Required
X
Credit 1
Water Efficient Landscaping
2-4
4
Credit 2
Innovative Wastewater Technologies
2
Credit 3
Water Use Reduction
2-4
Total
10
4


LEED Water Efficiency


LEED –Energy & Atmosphere
Credit No.
Credit Category
Possible Points
Points Achieved
Prerequisite
Fundamental Commissioning of Building Energy Systems
Required
X
Prerequisite
Minimum Energy Performance
Required
X
Prerequisite
Fundamental Refrigerant Management
Required
X
Credit 1
Optimizing Energy Performance
1-10
Credit 2
On-site Renewable Energy
1-7
Credit 3
Enhanced Commissioning
2
Credit 4
Enhanced Refrigeration Management
2
Credit 5
Measurement and Verification
3
Credit 6
Green Power
2
2
Total
35
7


LEED Energy & Atmosphere


LEED – Materials & Resources
Credit No.
Credit Category
Possible Points
Points Achieved
Prerequisite
Storage and Collection of Recyclables
Required
X
Credit 1.1
Building Reuse – Maintain Existing Walls, Floors, and Roof
1-3
3
Credit 1.2
Building Reuse – Maintain Existing Interior Nonstructural Elements
1
0
Credit 2
Construction Waste Management
1-2
1
Credit 3
Material Reuse
1-2
1
Credit 4
Recycled Content
1-2
1
Credit 5
Regional Materials
1-2
1
Credit 6
Rapidly Renewable Materials
1
0
Credit 7
Certifiable Wood
1
0
Total
14
7

LEED – Indoor Air Quality

Credit No.	Credit Category	Possible Points	Points Achieved
Prerequisite	Minimum Indoor Air Quality Performance	Required	X
Prerequisite	Environmental Tobacco Smoke Control	Required	X
Credit 1	Outdoor Air Delivery Monitoring	1	1
Credit 2	Increased Ventilation	1	
Credit 3.1	Construction Indoor Air Quality Management Plan – During Construction	1	1
Credit 3.2	Construction Indoor Air Quality 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	
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	

LEED – Indoor Air Quality

LEED Strategy (cont)

- Innovative Design
- Regional Credits

Charrette

Credit Area		Possible Points	Points Achieved
SS	Sustainable Sites	26	9
WE	Water Efficiency	10	4
EA	Energy and Atmosphere	35	7
MR	Material and Resources	14	7
IEQ	Indoor Environmental Quality	15	7
ID	Innovation in Design	5	1
RP	Regional Priority	4	2
	Totals	110	37

100 base points + 6 Innovation in Design + 4 Regional Priority

Certified 40–49 points
Silver 50–59 points
Gold 60–79 points
Platinum 80 points and above

Group 1 - LEED Strategy

Focus on energy and occupant comfort. A total interior gut, including all mechanical and HVAC systems:

- increased R-value and reduce infiltration
- added insulation to interior walls and roof
- replacement windows
- chilled water system, heat pumps, heat recovery
- ground source heat exchange system
- air exchange to improve air quality
- renewable energy – solar PV panels
- enhanced commissioning
- efficient lighting
- green or white roof

Group 1 - LEED Strategy

- point-of-use controls
- remove drop ceiling for daylighting
- resilient flooring
- low VOC materials
- designed for compatible spaces
- CO^2 monitoring
- use of local materials – availability good
- reduce window infiltration and add insulation

- Total - 63 points - low Gold

Group 2 – LEED Strategy

Sustainable Sites (total 13 points):

- Increase pervious surfaces –.
- Heat island – nonroof through increase pervious surface, and roof through light/white color.

Water Efficiency (total 6–8 points):

- Current culture within INARNG is against waterless urinals due to status of maintenance contracts;.
- Focus on water-use reduction.

Group 2

Energy and Atmosphere (total 19–22 points):

- new windows to reduce infiltration
- solar and/or geothermal
- enhanced commission
- monitoring and verification
- refrigerant use reduced or excluded

Materials and Resources (total 9 points):

- construction waste management
- recycled content increased
- did not feel rapidly renewable or certified wood use was practical

- Total - 61–65 points. – Low Gold

Charrette Outcomes

- LEED Silver - Attainable
- ADA/ABA - manageable
- ATFP – Adverse Effect!

ANTITERRORISM/FORCE PROTECTION (ATFP)

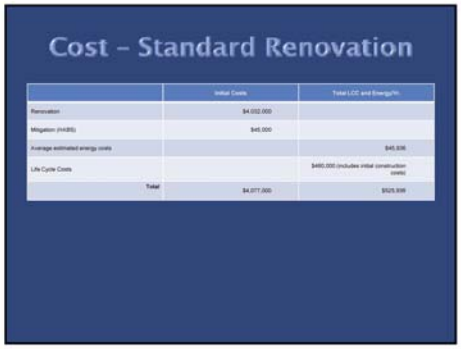
- Maximize standoff distance
- Prevent building collapse
- Minimize hazardous flying debris
- Limit airborne contamination
- Provide mass notification
- Effective building layout

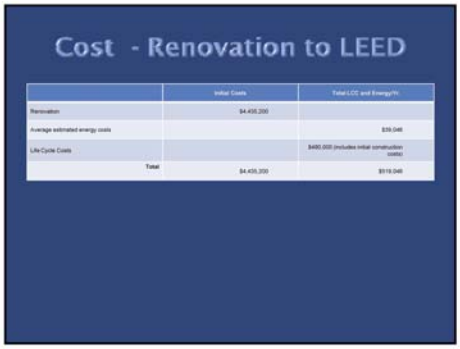
ANTITERRORISM/FORCE PROTECTION (ATFP)

- Options:
  - Reinforcing the existing walls of Building 5 to withstand a 250-pound car bomb and removing the windows along the east elevation on 1st & 2nd floors
  - Moving Holt Road and installing blast-resistant windows and 8-inch concrete walls.
  - Building a blast wall along the east elevation 10 to 15 feet high (windows would still require reinforcement).

Life Cycle Costs

- LCC is the sum of initial building cost plus recurring and one-time (nonrecurring) costs over the full life span of the building.
- LCC includes initial construction plus purchase price, installation, operation, maintenance and upgrade for systems (like HVAC) and materials (like flooring and roofing) averaged per year of the building life, (25 years).
- Energy costs are estimated separately.





Cost Comparison – Benefits of LEED renovation over New Construction

Initial (construction costs)

- $790,600 (+18%) savings – regular new
- $1,162,660 (+21%) savings – LEED new

- Life Cycle Costs
- $5,742/yr (+15%) savings - energy
- -$12,000/yr (-3%) – Life Cycle
- -$6,258/yr or -$156,450/25 yrs (-1%) - new
- $21,320/yr or $533,000/25 yrs (+4%) – LEED new

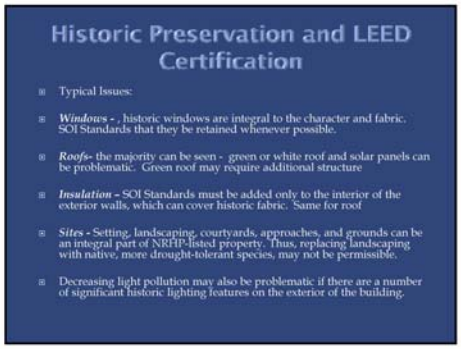
Cost Comparison - Renovations

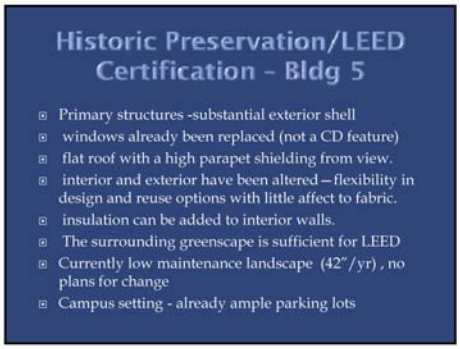
Initial Costs

- -$358,200 (-9%)

Life Cycle Costs

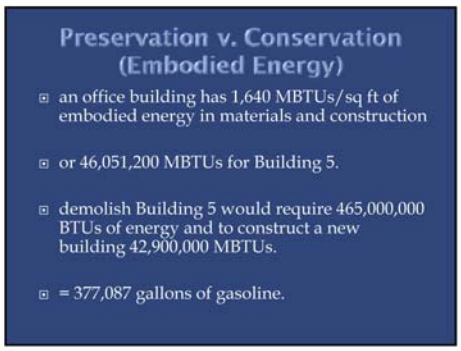
- $6,890/yr (+15%) - energy
- 0 – life cycle
- $6,890/yr or $172,250/25 yrs (+1%)

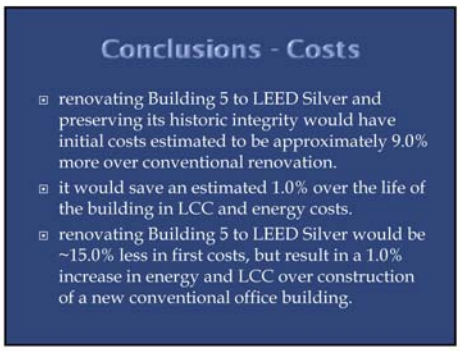

Historic Preservation and LEED Certification
Typical Issues:
Windows - , historic windows are integral to the character and fabric. SOI Standards that they be retained whenever possible.
Roofs- the majority can be seen - green or white roof and solar panels can be problematic. Green roof may require additional structure
Insulation - SOI Standards must be added only to the interior of the exterior walls, which can cover historic fabric. Same for roof
Sites - Setting, landscaping, courtyards, approaches, and grounds can be an integral part of NRHP-listed property. Thus, replacing landscaping with native, more drought-tolerant species, may not be permissible.
Decreasing light pollution may also be problematic if there are a number of significant historic lighting features on the exterior of the building.


Historic Preservation/LEED Certification – Bldg 5
Primary structures -substantial exterior shell
windows already been replaced (not a CD feature)
flat roof with a high parapet shielding from view.
interior and exterior have been altered – flexibility in design and reuse options with little affect to fabric.
insulation can be added to interior walls.
The surrounding greenscape is sufficient for LEED
Currently low maintenance landscape (42"/yr) , no plans for change
Campus setting - already ample parking lots


Non-Invasive Green Treatments
using public transportation and carpools
providing changing rooms for bicycle riders/joggers
using electric power vehicles
programming utilities to reflect office-hour comfort
using green building cleaning products
using native plant species that require less care
retaining historic materials and features


Non-Invasive Green Treatments (cont)
recycling demolition waste of nonhistoric materials
integrating new high-content recycled materials
improving energy efficiency of exterior envelope/windows
reducing water flow in bathrooms
using motion detectors to control lighting levels
changing out light fixtures to compact fluorescents
using high efficiency HVAC systems
using "gray" or rainwater for irrigation (check State law)


Preservation v. Conservation (Embodied Energy)
an office building has 1,640 MBTUs/sq ft of embodied energy in materials and construction
or 46,051,200 MBTUs for Building 5.
demolish Building 5 would require 465,000,000 BTUs of energy and to construct a new building 42,900,000 MBTUs.
= 377,087 gallons of gasoline.


Conclusions - Costs
renovating Building 5 to LEED Silver and preserving its historic integrity would have initial costs estimated to be approximately 9.0% more over conventional renovation.
it would save an estimated 1.0% over the life of the building in LCC and energy costs.
renovating Building 5 to LEED Silver would be ~15.0% less in first costs, but result in a 1.0% increase in energy and LCC over construction of a new conventional office building.

Conclusion

- It is both economically and technologically possible to renovate Building 5 to LEED Silver AND have no adverse effect on the historic integrity of the building.
- However, meeting ATFP standards will have an adverse effect.

Epilogue

- Building 5 will be renovated for use as a one-unit armory (different use).
- This project was conducted as a Legacy project and not by INARNG. They are not required to integrate our strategies. However, the architectural firm (who was involved in the charrette) say they will incorporate green design, but it is not known yet if they will pursue LEED – budget dependent.

Questions?

"Environmentalists cheer when used tires are incorporated into asphalt shingles and recycled newspapers become part of fiberboard. But when we reuse a historic building, we're recycling the whole thing" (Rypkema 2007).

APPENDIX G: PROJECT CONTRIBUTORS

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APPENDIX G: PROJECT CONTRIBUTORS

Indiana Army National Guard, Indianapolis, Indiana

- Mark Swain, INARNG Plant (Facility) Manager
- Roger Bricker, INARNG Energy Manager
- Jim O'Brien, INARNG Project Manager / Facilities Engineering
- Bob Taylor, INARNG ATFP Expert
- Nathan Eaton, INARNG Planning Office/GIS
- Bob Atnip, INARNG Master Planner

Indiana Division of Historic Preservation and Archaeology / State Historic Preservation Office, Indianapolis, Indiana

- Chad Slider
- David Duvall

RQAW Consulting Engineers and Architects, Indianapolis, Indiana

- Sanjay Patel
- James Smith

Indiana Chapter of the U.S. Green Building Council, Indianapolis, Indiana

- Mac Williams, LEED AP, Inverde Architect

Hardlines Design, Columbus, Ohio

- Charissa Durst

RTM Consultants, Inc.

- Melissa Tupper

AARCHER, Inc.

- Jayne Aaron, LEED AP, Architectural Historian, Project Manager

Ms. Aaron has over 18 years of hands-on experience as a project manager, architectural historian/cultural resources specialist, and NEPA specialist. She has over 15 years of experience managing programs and contracts for federal clients. Ms. Aaron meets the qualifications of the Secretary of the Interior for Architectural Historian. She has been involved in all aspects of Section 106 compliance for cultural resources, including the evaluation of U.S. Coast Guard vessels, numerous military installations, and other buildings and structures. She has also designed innovative strategies and management plans to integrate new and existing regulations, policies, and guidance, and cultural and natural resource

management activities into single planning and compliance programs, including NEPA, Environmental Justice, and the National Historic Preservation Act, and Native American Graves Protection and Repatriation Act. As part of her compliance responsibilities, Ms. Aaron has participated in consultation and meetings with a variety of stakeholder groups, including state and federal regulators, American Indian tribes, environmental consultants, and the public. She has written public releases, given presentations, responded to public comments, and facilitated meetings for various sized groups. She has also designed and developed training courses, and has taught in numerous educational and training programs.

- Sarah Schill, Charrette Support (subcontractor)