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Engineer Research and
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Application of LEED™ and SPiRiT to a Proposed Building Design

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Ducey, Franklin Holcomb, Eric Johnson, Paul Loechl,
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Final Report

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ABSTRACT: The planned U.S. Army Environmental Center (AEC) administrative and command functions facility at Aberdeen Proving Ground, MD has been designated an “Army Showcase Project,” which must incorporate the principles of sustainable design and development (SDD), and be worthy of the Sustainable Project Rating Tool (SPiRiT) “platinum” level rating, and the U.S. Green Building Counsel’s (USGBC) rating of “platinum” for Leadership in Energy and Environmental Design (LEED™). The U.S. Army Engineer Research Development Center, Construction Engineering Research Laboratory (ERDC/CERL) was tasked with performing an independent review of the preliminary DD Form 1391 to: (1) determine if the proposed design will rate “platinum” in SPiRiT and LEED™, and if not, how to improve the design to ensure the “platinum” rating; (2) determine the proposed energy savings from the base case model to the proposed design, and (3) review the SPiRiT and LEED™ credits claimed by the A/E, and determine if any new credits will be associated with CERL-recommended design features. This study concluded that, with appropriate funding and review, this project has the potential to earn the “platinum” rating on both LEED™ and SPiRiT criteria, and to achieve improvements in energy savings over the baseline case.

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Conversion Factors

Non-SI* units of measurement used in this report can be converted to SI units as follows:

Multiply	By	To Obtain
acres	4,046.873	square meters
cubic feet	0.02831685	cubic meters
cubic inches	0.00001638706	cubic meters
degrees (angle)	0.01745329	radians
degrees Fahrenheit	5/9	degrees Celsius or kelvins ¹
feet	0.3048	meters
gallons (U.S. liquid)	0.003785412	cubic meters
horsepower (550 ft-lb force per second)	745.6999	watts
inches	0.0254	meters
kips per square foot	47.88026	kilopascals
kips per square inch	6.894757	megapascals
miles (U.S. statute)	1.609347	kilometers
pounds (force)	4.448222	newtons
pounds (force) per square inch	0.006894757	megapascals
pounds (mass)	0.4535924	kilograms
square feet	0.09290304	square meters
square miles	2,589,998	square meters
tons (force)	8,896.443	newtons
tons (2,000 pounds, mass)	907.1847	kilograms
yards	0.9144	meters
¹ To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use the following formula: $C = (5/9)(F - 32)$. To obtain kelvin (K) readings, use: $K = (5/9)(F - 32) + 273.15$.		

* *Système International d'Unités* ("International System of Measurement"), commonly known as the "metric system."

Preface

This study was conducted for The U.S. Army Environmental Center (USAEC) under Military Interdepartmental Purchase Request (MIPR) No. 3C48R00030, “USAEC Independent Assessment of Proposed Headquarters & Administration Building by ERDC/CERL,” dated 18 December 2002. The technical monitor was LTC James Price, SFIM-AEC-EN.

The work was performed by the Energy Branch (CF-E) and the Engineering Processes Branch (CF-N) of the Facilities Division (CF); the Environmental Processes Branch (CN-E); Business Processes Branch (CN-B); and the Land and Heritage Conservation Branch (CN-C), of the Facilities Division (CN); Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL). The ERDC-CERL Principal Investigators were Sarah B. Nemeth, CN-B, and John Vavrin, CF-E. Gary Phetteplace is associated with the Applied and Military Engineering Branch, Cold Regions Research and Engineering Laboratory (CRREL). Donald Fournier is associated with the University of Illinois, Urbana-Champaign. Perrin Pellegrin works as a private LEED™ contractor. Dr. Thomas Hartranft is Chief, CEERD-CF-E; Donald K. Hicks is Chief, CEERD-CF-N; Dr. Kumar Topudurti is Chief, CEERD-CN-E; Dr. Moonja Kim is Chief, CN-B; Dr. Lucy A. Whalley is Chief, CEERD-CN-C. L. Michael Golish is Chief, CEERD-CF and John Bandy is Chief, CEERD-CN. The CERL technical editor was William J. Wolfe, Information Technology Laboratory. The associated Technical Director is Dr. Paul A. Howdyshell, CEERD-CV-T. The Director of CERL is Dr. Alan W. Moore.

CERL and CRREL are elements of the U.S. Army Engineer Research and Development Center (ERDC), U.S. Army Corps of Engineers. The Commander and Executive Director of ERDC is COL John Morris III, EN and the Director of ERDC is Dr. James R. Houston.

1 Introduction

Background

The U.S. Army Environmental Center (AEC) is consolidating its administrative and command functions into a single facility at Aberdeen Proving Ground, MD. The Assistant Chief of Staff for Installation Management (ACSIM) has designated this facility as an Army Showcase Project. The building must therefore incorporate the principles of sustainable design and development (SDD). In addition, the building will meet criteria for a “platinum” level rating for both the U.S. Green Building Council’s (USGBC’s) Leadership in Energy and Environmental Design (LEED™) rating tool, and the U.S. Army’s Sustainable Project Rating Tool (SPiRiT).

In October 2002, a planning charrette was conducted at AEC by the Architect/Engineer firm (A/E), Michael Baker Corporation of Pittsburgh, PA, through a contract with the Baltimore District of the U.S. Corps of Engineers. The planning charrette served to facilitate development of the preliminary DD Form 1391 for the 95,500 sq ft headquarters administrative facility at Aberdeen Proving Ground, MD. In December, 2002, AEC contracted with the U.S. Army Engineer Research Development Center, Construction Engineering Research Laboratory (ERDC/CERL) to perform an independent review of the preliminary DD Form 1391 to:

- determine if the proposed design will rate “platinum” in SPiRiT and LEED™, and if not, how to improve the design to ensure the “platinum” rating
- determine the proposed energy savings from the base case model to the proposed design
- review the SPiRiT and LEED™ credits claimed by the A/E, and determine if any new credits will be associated with CERL-recommended design features.

Objective

The objectives of this research are to:

1. Support the AEC facility’s building approval process
2. Provide AEC with sufficient information to direct the A/E firm’s proposed design, as described in the planning charrette, to meet the requirements for a “platinum” rating in SPiRiT and LEED™

3. Ensure that all necessary and appropriate information is included in the DD Form 1391, which is undergoing revision and will be finalized by the A/E firm in March 2003.

Approach

CERL organized a project team consisting of CERL researchers and external expert consultants from the University of Illinois at Urbana-Champaign and private practice. In addition, AEC requested the involvement of two private practice consultants as members of the project team based on their expertise with building projects that had each attained LEED™ “platinum” status.

Expedited project coordination was critical because AEC needed the results of this work in just 7 weeks. CERL identified needed documentation at the start of the program in mid-December and then coordinated collection and review of these materials over the December holidays. A kick-off meeting conference call was conducted on 7 January 2003 to ensure that participants understood and agreed upon all aspects of the project. Individuals participating in the conference call included representatives from AEC, CERL, the A/E firm, the Baltimore District of the Corps of Engineers, the consultant from the University of Illinois, and one of the private consultants. CERL sent AEC and the A/E firm a request for additional information on 8 January 2003.

The project team conducted a technical assessment that focused on three primary issues by analyzing the planning charrette documentation to:

1. determine if the SPiRiT and LEED™ credits anticipated by the A/E firm were or were not adequately supported in the documentation
2. identify credits not anticipated by the A/E firm, but with potential to earn these specific credits
3. determine if the preliminary DD Form 1391 contained appropriate language and costs to secure Army approval for the project.

Team members submitted their preliminary input to the principal investigator on 21 January 2003. The principal investigator merged the comments into the appropriate SPiRiT categories and electronically mailed this merged file as “read ahead” material to the invitees of the site visit meeting.

A site visit was conducted at AEC on 23 January 2003, to discuss the preliminary findings. Three members of CERL’s project team met with members of AEC Staff,

the Baltimore District, and the A/E firm. Due in part to the length of the preliminary report and to the fact that several A/E members possessing specific knowledge were not in attendance, the A/E firm consented to review the preliminary document and address specific concerns raised by CERL (Appendix A) at a later, unspecified date. At the time of this writing, no response has been received. Chapter 3 of this report details the project team's consolidated comments, and discusses issues which impact the potential to earn LEED™ and SPiRiT credits.

Mode of Technology Transfer

Results of this work will be provided directly to the sponsoring agency in electronic and hard-copy formats (a written report and Microsoft® PowerPoint® presentation slides).

This report will also be made accessible through the World Wide Web (WWW) at URL:

<http://www.cecer.army.mil>

Supplemental information related to this study will be made available through URL:

<http://aec.army.mil/usaec/>

2 Certification Process in LEED™ and SPiRiT

ACSIM designated the subject facility as an “Army Showcase Project.” The building must therefore incorporate the principles of sustainable design and development (SDD). In addition, the building will meet criteria for a “platinum” level rating for both the U.S. Green Building Council’s (USGBC’s) Leadership in Energy and Environmental Design (LEED™) rating tool, and the U. S. Army’s Sustainable Project Rating Tool (SPiRiT).

The LEED™ Certification process begins with project registration. Registering the project and setting LEED™ design goals in the early phases of project design is critical to ensure the maximum certification potential. In addition, the registration process initiates contact with the USGBC and permits access to pertinent information and software tools. Projects are rated according to the LEED™ version in effect at the time of project registration. The second step, application preparation by the project team, includes various documentation and calculations. To field questions from project teams concerning LEED™ requirements, the USGBC has created a standardized review process (“credit interpretation requests”). This uniform review procedure helps ensure that consistent decisions are made. Information pertaining to these credit interpretation requests are posted on the USGBC’s website (www.usgbc.org) to permit others access to these rulings. The final step in the Certification process is actual certification, which consists of application submittal by the project team, followed by administrative review, technical review, and award by the USGBC. Current registration and certification fees (which are subject to change) for the proposed 95,500 sq ft project are approximately \$1,200 and \$2,400, respectively.

SPiRiT is a self-evaluation rating procedure, and as such, there is no certification process *per se*. The timing of the self-evaluation is not specified, merely that the projects must be rated. Per ETL 1110-3-491,* Appendix B, paragraph 12A:

* Engineer Technical Letter (ETL) 1110-3-491, *Sustainable Design For Military Facilities* (Headquarters, U.S. Army Corps of Engineers [HQUSACE], 1 May 2001).

SPiRiT is a USACE developed rating tool that resulted from the Army Chief of Staff for Installation Management (ACSIM) memo, 1 May 2000 decreeing that all future facilities be designed and built according to sustainable principles as well as requesting USACE to provide technical guidance to support this initiative. USACE has a licensed agreement with the U.S. Green Building Council permitting us to use its name Leadership in Energy and Environmental Design (LEED™) as part of SPiRiT. The LEED™ Green Building Rating System is a proprietary program of the U.S. Green Building Council. With the use of SPiRiT we [USACE] will ensure that Sustainable Design and Development is considered in Army installation planning decisions and infrastructure projects to the fullest extent possible, balanced with funding constraints and customer requirements. Based on existing proven technology it evaluates environmental performance from a “whole building” perspective over a building’s life cycle, providing a definitive standard for what constitutes a “green building.” As a minimum we [USACE] shall use SPiRiT to score our design and strive to meet the SPiRiT Bronze certification level. When the recommended Bronze level is not achieved, the [USACE] District Project Delivery Team’s Project Manager will report the issue to the MSC Program Manager and to the PM at HQUSACE with an explanation as to why this level cannot be achieved. The HQUSACE PM will forward this information to Engineering Team of Technical Policy Branch, Engineering and Construction Division.

Note that, during the course of this project, Major General Lust of ASCIM issued a memorandum, dated 21 December 2002, that all MILCOM projects beginning with the FY06 program achieve a minimum SPiRiT rating of “silver.”

The following chapter includes the proposed scoring checklists (i.e., the LEED™ and SPiRiT checklists) for this project by the A/E firm based on the LEED™ and SPiRiT criteria. These checklists also include the proposed scoring based on CERL’s review of the DD Form 1391 documentation. A detailed discussion of each credit in question, based on CERL’s review, follows.

3 Analysis of Proposed Credits for LEED™ and SPiRiT Criteria

SPiRiT is derived from The U.S. Green Building Council LEED™ 2.0 “Green Building Rating System” used by industry. The SPiRiT numbering scheme parallels, but does not exactly match LEED™ 2.0. LEED™ does not number major sections, which it calls “Credit Categories,” (e.g., “Sustainable Sites”). Rather, it numbers criteria or “credits” within each major section. SPiRiT credit numbers match those of LEED™ where there is a one-to-one comparison. Where additional SPiRiT credits have been added, they fall at the end of the major sections. LEED™ includes the category “Innovation & Design Process,” that is not included in SPiRiT. SPiRiT includes three additional categories that relate specifically to the Army and, therefore, are not included in LEED™. These additional SPiRiT categories are: “Facility Delivery Process,” “Current Mission,” and “Future Missions.”

The LEED™ criteria are based on a 69-point scale. “Platinum-rated” buildings must score a minimum of 52 points. Based on CERL’s analysis, the project will obtain 36 points according to the LEED™ criteria. However, there is potential for 22 additional points that represent:

1. Credits anticipated by the A/E firm, but not addressed or documented sufficiently based on CERL’s review, or
2. Potential credits that CERL anticipates should be attempted, and could be earned, that were not deemed achievable by the A/E firm.

Thus, according to CERL’s review, this project has the potential to earn 58 points based on LEED™ criteria.

The SPiRiT criteria are based on a 100-point scale. “Platinum-rated” buildings must score a minimum of 75 points. Based on CERL’s analysis, the project will obtain 62 points according to the SPiRiT criteria. However, there is potential for 24 additional points that represent:

1. Credits anticipated by the A/E firm, but not addressed or documented sufficiently based on CERL’s review, or
2. Potential credits that CERL anticipates should be attempted, and could be earned, that were not deemed achievable by the A/E firm.

Thus, according to CERL's review, this project has the potential to earn 86 points based on SPiRiT criteria.

The LEED™ and SPiRiT scoring checklists (Tables 1 and 2) contain three columns on the left side of the checklists. The first column ("A/E Firm") represents those points claimed by the A/E firm. The second column ("CERL Review") represents points in which CERL contends have been earned, based on the DD Form 1391 documentation. The third column ("Improvement") represents: (1) credits anticipated by the A/E firm, but not addressed or documented sufficiently based on CERL's review, or (2) potential credits that CERL anticipates should be attempted, and could be earned, that were not deemed achievable by the A/E firm. The column the right side of the checklists represents the total possible points available.

Table 1. LEED™ Project Checklist.

LEED™ Project Checklist					
A/E Firm*	CERL Review*	Improvement			Total Possible Points
			*✓ = "Required"		
			Credit	Description	✓
Sustainable Sites					
✓	✓		Prereq 1	Erosion & Sedimentation Control	✓
1	1		Credit 1	Site Selection	1
0	0		Credit 2	Urban Redevelopment	1
1	0	1	Credit 3	Brownfield Redevelopment	1
1	1		Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	1		Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
1	0	1	Credit 4.3	Alternative Transportation, Alternative Fuel Vehicles	1
1	1		Credit 4.4	Alternative Transportation, Parking Capacity	1
1	0	1	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1	0	1	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
1	1		Credit 6.1	Stormwater Management, Rate and Quantity	1
1	0	1	Credit 6.2	Stormwater Management, Treatment	1
1	1		Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, NonRoof	1
1	1		Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	0	1	Credit 8	Light Pollution Reduction	1
13	7	6	SUBTOTAL		14
Water Efficiency					
1	1		Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	1		Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
0	0	1	Credit 2	Innovative Wastewater Technologies	1
1	1		Credit 3.1	Water Use Reduction, 20% Reduction	1
0	0	1	Credit 3.2	Water Use Reduction, 30% Reduction	1

LEED™ Project Checklist					
A/E Firm*	CERL Review*	Improvement			Total Possible Points
			*✓ = "Required"		
3	3	2	SUBTOTAL		5
Energy & Atmosphere					
✓	✓		Prereq 1	Fundamental Building Systems Commissioning Required	✓
✓	✓		Prereq 2	Minimum Energy Performance Required	✓
✓	✓		Prereq 3	CFC Reduction in HVAC&R Equipment Required	✓
2	2		Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
?	0	2	Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
?	0	2	Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
			Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
			Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
1	0	0	Credit 2.1	Renewable Energy, 5%	1
1	0	0	Credit 2.2	Renewable Energy, 10%	1
			Credit 2.3	Renewable Energy, 20%	1
1	1		Credit 3	Additional Commissioning	1
1	1		Credit 4	Ozone Depletion	1
1	1		Credit 5	Measurement & Verification	1
1	0	1	Credit 6	Green Power	1
8	5	5	SUBTOTAL		17
Materials & Resources					
✓	✓		Prereq 1	Storage & Collection of Recyclables Required	✓
1	0	0	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
			Credit 1.2	Building Reuse, Maintain 100% of Shell	1
			Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	1		Credit 2.1	Construction Waste Management, Divert 50%	1
1	1		Credit 2.2	Construction Waste Management, Divert 75%	1
1	1		Credit 3.1	Resource Reuse, Specify 5%	1
1	0	1	Credit 3.2	Resource Reuse, Specify 10%	1
1	1		Credit 4.1	Recycled Content, Specify 25%	1
1	0	1	Credit 4.2	Recycled Content, Specify 50%	1
1	1		Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1	1		Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
1	1		Credit 6	Rapidly Renewable Materials	1
1	1		Credit 7	Certified Wood	1
11	8	2	SUBTOTAL		13

LEED™ Project Checklist					
A/E Firm*	CERL Review*	Improvement			Total Possible Points
*✓ = "Required"					
Indoor Environmental Quality					
✓	✓		Prereq 1	Minimum IAQ Performance Required	✓
✓	✓		Prereq 2	Environmental Tobacco Smoke (ETS) Control Required	✓
1	1		Credit 1	Carbon Dioxide (CO ₂) Monitoring	1
1	1		Credit 2	Ventilation Effectiveness	1
1	1		Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	1		Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	1		Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	1		Credit 4.2	Low-Emitting Materials, Paints	1
1	1		Credit 4.3	Low-Emitting Materials, Carpet	1
1	1		Credit 4.4	Low-Emitting Materials, Composite Wood	1
1	1		Credit 5	Indoor Chemical & Pollutant Source Control	1
1	1		Credit 6.1	Controllability of Systems, Perimeter	1
0	0	1	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	1		Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	1		Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
1	0	1	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	0	1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1
14	12	3	SUBTOTAL		15
Innovation & Design Process					
1	0	1	Credit 1.1	Innovation in Design	1
1	0	1	Credit 1.2	Innovation in Design	1
1	0	1	Credit 1.3	Innovation in Design	1
1	0	1	Credit 1.4	Innovation in Design	1
1	1		Credit 2	LEED™ Accredited Professional	1
5	1	4	SUBTOTAL		5
Project Totals		LEED™ Ratings			Total Possible Points
54	36	22	Certified: 26-32 points Silver: 33-38 points Gold: 39-51 points Platinum: 52-69 points		69
LEED™ Green Building Rating System Version 2.1 (U.S. Green Building Council, November 2002, rev. 16 January 2003).					

Table 2. SPiRiT Project Checklist.

SPiRiT Project Checklist					
A/E Firm	CERL Review*	Improvement	* ✓ = "Required"		Total Possible Points
			Credit	Description	
			1.0	Sustainable Sites	
✓	✓		1.R1.1	Erosion, and Sedimentation and Water Quality Control.	✓
1	1		1.C1.1	Site Selection: Avoid development of inappropriate sites.	1
1	1		1.C1.2	Site Selection: Select site based on functional adjacency and land use compatibility.	1
1	0	0	1.C2.1	Installation/Base Redevelopment: Increase localized density.	1
1	1		1.C2.2	Installation/Base Redevelopment: Select sites close to existing roads and utilities.	1
0	0	1	1.C3.1	Brownfield Redevelopment.	1
1	1		1.C4.1	Alternative Transportation: Installation/base transit system access.	1
1	1		1.C4.2	Alternative Transportation: Provide bicycle racks and changing/shower facilities	1
0	0	1	1.C4.3	Alternative Transportation: Locate near alternative-fuel refueling stations.	1
1	1		1.C4.4	Alternative Transportation: Size parking capacity and provide preferred parking.	1
0	0	1	1.C5.1	Reduced Site Disturbance: Protect OR restore previously developed sites.	1
1	0	1	1.C5.2	Reduced Site Disturbance: Reduce the development footprint.	1
1	1		1.C6.1	Stormwater Management: Implement a stormwater management plan.	1
0	0	1	1.C6.2	Stormwater Management: Implement EPA's Best Management Practices.	1
1	1		1.C7.1	Landscape and Exterior Design to Reduce Heat Islands: Provide shade on the site.	1
1	1		1.C7.2	Landscape and Exterior Design to Reduce Heat Islands: Energy Star compliant roof.	1
1	0	1	1.C8.1	Light Pollution Reduction.	1
1	0	1	1.C9.1	Optimize Site Features.	1
1	0	0	1.C10.1	Facility Impact: Cluster facilities to reduce site impact and support mass transit.	1
1	1		1.C10.2	Facility Impact: Identify and mitigate potential impacts beyond site boundaries.	1
1	0	1	1.C11.1	Site Ecology.	1
16	10	8	SUBTOTAL		20
			2.0	Water Efficiency	
1	1		2.C1.1	Water Efficient Landscaping: Use technology OR capture or recycle site water.	1
1	1		2.C1.2	Water Efficient Landscaping: Use only captured or recycled water; no irrigation system.	1
0	0	1	2.C2.1	Innovative Wastewater Technologies.	1
1	1		2.C3.1	Water Use Reduction: Reduce water use by 20%.	1
0	0	1	2.C3.2	Water Use Reduction: Reduce water use by 30%.	1
3	3	2	SUBTOTAL		5

SPiRiT Project Checklist					
A/E Firm	CERL Review*	Improvement	* ✓ = "Required"		Total Possible Points
			Credit	Description	
			3.0	Energy and Atmosphere	
✓	✓		3.R1.1	Fundamental Building Systems Commissioning.	✓
✓	✓		3.R2.1	Minimum Energy Performance (TI 800-01).	✓
✓	✓		3.R3.1	CFC Reduction in HVAC&R Equipment	✓
12	8	8	3.C1.1	Optimize Energy Performance: 1 point per 2.5% energy reduction (from baseline).	20
0	0	0	3.C2.1	Renewable Energy: 5% on-site renewable energy system.	1
0	0	0	3.C2.2	Renewable Energy: 10% on-site renewable energy system.	1
0	0	0	3.C2.3	Renewable Energy: 15% on-site renewable energy system.	1
0	0	0	3.C2.4	Renewable Energy: 20% on-site renewable energy system.	1
1	1		3.C3.1	Additional Commissioning.	1
			3.C4.1	<<Ozone Depletion—Deleted in SPiRiT>>	
1	1		3.C5.1	Measurement and Verification.	1
0	0	1	3.C6.1	Green Power.	1
0	0	0	3.C7.1	Distributed Generation.	1
14	10	9	SUBTOTAL		28
			4.0	Materials and Resources	
✓	✓		4.R1.1	Storage & Collection of Recyclables.	✓
0	0	0	4.C1.1	Building Reuse: Maintain at least 75% of existing building structure and shell.	1
0	0	0	4.C1.2	Building Reuse: Maintain 100% of existing building structure and shell.	1
0	0	0	4.C1.3	Building Reuse: Maintain 100% of existing building structure, shell and 50% nonshell systems.	1
1	1		4.C2.1	Construction Waste Management: Recycle and/or salvage at least 50% of waste.	1
1	1		4.C2.2	Construction Waste Management: Recycle and/or salvage at least 75% of waste.	1
1	1		4.C3.1	Resource Reuse: Specify salvaged or refurbished materials for 5% of building materials.	1
1	0	1	4.C3.2	Resource Reuse: Specify salvaged or refurbished materials for 10% of building materials.	1
1	1		4.C4.1	Recycled Content: Specify 25% of materials that contain post-consumer recycled content.	1
1	0	1	4.C4.2	Recycled Content: Specify 50% of materials that contain post-consumer recycled content.	1
1	1		4.C5.1	Local/Regional Materials: Specify a minimum of 20% building materials that are made locally.	1
1	1		4.C5.2	Local/Regional Materials: Of these (20%) a minimum 50% that are obtained locally.	1
1	1		4.C6.1	Rapidly Renewable Materials.	1
1	1		4.C7.1	Certified Wood.	1
10	8	2	SUBTOTAL		13

SPiRiT Project Checklist					
A/E Firm	CERL Review*	Improvement	* ✓ = "Required"		Total Possible Points
			Credit	Description	
			5.0	Indoor Environmental Quality (IEQ)	
✓	✓		5.R1.1	Minimum IAQ Performance.	✓
✓	✓		5.R2.1	Environmental Tobacco Smoke (ETS) Control.	✓
1	1		5.C1.1	IAQ Carbon Dioxide (CO2) Monitoring.	1
1	1		5.C2.1	Increase Ventilation Effectiveness.	1
1	1		5.C3.1	Construction IAQ Management Plan: During construction IAQ requirements.	1
1	1		5.C3.2	Construction IAQ Management Plan: Before occupancy IAQ requirements.	1
1	1		5.C4.1	Low-Emitting Materials: Adhesive & Sealants.	1
1	1		5.C4.2	Low-Emitting Materials: Paints.	1
1	1		5.C4.3	Low-Emitting Materials: Carpets.	1
1	1		5.C4.4	Low-Emitting Materials: Composite wood.	1
1	1		5.C5.1	Indoor Chemical and Pollutant Source Control	1
1	1		5.C6.1	Controllability of Systems: Provide high level of occupant perimeter controls.	1
1	0	1	5.C6.2	Controllability of Systems: Provide high level of occupant nonperimeter controls.	1
1	1		5.C7.1	Thermal Comfort: Provide shade on the site.	1
1	1		5.C7.2	Thermal Comfort: Use Energy Star compliant roofing OR install a green roof.	1
1	0	1	5.C8.1	Daylight and Views: 2% Daylight Factor in 75% of all occupied spaces.	1
1	0	1	5.C8.2	Daylight and Views: Line of sight to vision glazing in 90% of all occupied spaces.	1
1	1		5.C9.1	Acoustic Environment/Noise Control.	1
1	1		5.C10.1	Facility In-Use IAQ Management Plan.	1
17	14	3	SUBTOTAL		17
			6.0	Facility Delivery Process	
1	1		6.C1.1	Holistic Delivery of Facility: Choose leaders with holistic project delivery experience.	1
1	1		6.C1.2	Holistic Delivery of Facility: Train PDT in the holistic delivery process.	1
1	1		6.C1.3	Holistic Delivery of Facility: Identify project goals and metrics (PMP).	1
1	1		6.C1.4	Holistic Delivery of Facility: Plan & execute charrettes with team members.	1
2	2		6.C1.5	Holistic Delivery of Facility: Identify and resolve conflicts in project requirements.	2
1	1		6.C1.6	Holistic Delivery of Facility: Document required deliverables that achieve project goals.	1
7	7	0	SUBTOTAL		7
			7.0	Current Mission	
2	2		7.C1.1	Operation and Maintenance: Develop a facility operations and maintenance program.	2
1	1		7.C1.2	Operation and Maintenance: Provide durable material surfaces, furnishings & equipment.	1
1	1		7.C2.1	Design for Soldier & Workforce Productivity & Retention: Enhance user's quality of life.	1
1	1		7.C2.2	Design for Soldier & Workforce Productivity & Retention: Promote work productivity.	1
1	1		7.C2.3	Design for Soldier & Workforce Productivity & Retention: Sustain QOL & productivity.	1
6	6	0	SUBTOTAL		6

SPiRiT Project Checklist					
A/E Firm	CERL Review*	Improvement	* ✓ = "Required"		Total Possible Points
			Credit	Description	
			8.0	Future Missions	
1	1		8.C1.1	Assess the Lifespan of the Designed Use and Supporting System: Identify function life.	1
1	1		8.C1.2	Assess the Lifespan of the Designed Use and Supporting System: Identify systems life.	1
1	1		8.C2.1	Design for Adaptation, Renewal and Future Uses: Design for flexibility.	1
1	1		8.C2.2	Design for Adaptation, Renewal and Future Uses: Design today for tomorrow.	1
4	4	0	SUBTOTAL		4
Project Totals		SPiRiT Ratings			Total Possible Points
77	62	24	Bronze: 25-34 points Silver: 35-49 points Gold: 50-74 points Platinum: 75-100 points		100

Detailed below are credits that remain in question according to CERL's review. The specific credits are grouped under their respective LEED™ and SPiRiT category. Note there some inconsistencies still exist in the documentation provided by the A/E firm. In some instances, the A/E firm claims credits in LEED™ without claiming the corresponding credits in SPiRiT and vice-versa.

1. Sustainable Sites

There are several instances in this category in which the A/E firm claims credit in either LEED™ or SPiRiT, but not both. First, the A/E firm does not claim LEED™ Credit 2, "Urban Redevelopment," but claims the two corresponding points in SPiRiT (i.e., "Installation/Base Redevelopment," Credits 1.C2.1 and 1.C2.2). Second, the A/E firm claims LEED™ Credit 3, "Brownfield Redevelopment," but does not claim the corresponding SPiRiT Credit 1.C3.1. Third, the A/E firm claims LEED™ Credit 4.3, "Alternative Transportation—Alternative Fuel Refueling Stations," but does not claim the corresponding SPiRiT Credit 1.C4.3. Fourth, the A/E firm claims LEED™ Credit 5.1, "Reduced Site Disturbance—Protect or Restore Open Space," but does not claim the corresponding SPiRiT Credit 1.C5.1. Fifth, the A/E firm claims LEED™ Credit 6.2, "Stormwater Management—Treatment," but

does not claim the corresponding SPiRiT Credit 1.C6.2, “Stormwater Management—Implement EPA’s Best Management Practices.”

Based on CERL’s review of the documentation, there are several points in this category in which LEED™ and SPiRiT credit attainment remain in question. Each of these points is listed below. Following each particular credit is the rationale for why the achievement of the point is in question, and an indication of whether or not CERL believes there is potential to earn the point for this project.

- “Urban Redevelopment” (LEED™ Credit 2) and “Installation/Base Redevelopment—Increase localized density” (SPiRiT Credit 1.C2.1).

The A/E firm does not claim this credit in LEED™, but claims the corresponding credit in SPiRiT. The increase of “localized density” is not shown or discussed in the DD Form 1391 documentation. This credit is rather interpretable to begin with, but the *spirit* of the credit is to encourage greater development density. The site chosen for this new building does not increase density, as it is merely rebuilding on an existing site. Additionally, this portion of the cantonment area is not particularly dense. Therefore, CERL does not concur with the A/E firm, and does not believe there is potential to earn this credit.

- “Brownfield Redevelopment” (LEED™ Credit 3, SPiRiT Credit 1.C3.1)

The A/E firm claims this credit in LEED, but not in SPiRiT. While not a DD Form 1391 comment *per se*, SPiRiT/LEED points may be achievable for “Brownfield Redevelopment.” Brownfield designation is not clear as no report from the EPA is mentioned even though the entire facility is considered a SuperFund site. It seems likely that either the mustard gas site or the white phosphorous site would qualify as a brownfield. In addition, the perceived non-potability of water at the site may be the basis for meeting the classification requirements for a brownfield site. Although contaminated lands on military installations are not classified as brownfields, under the EPA’s Brownfield Redevelopment program requirements, lands where pollutants, hazardous materials, and contaminants are present that would designate it as a brownfield according to the EPA definition are considered “brownfields” under SPiRiT/LEED. The Aberdeen Proving Ground (APG) environmental office can identify those lands that are contaminated, and the nature of that contamination, for the purposes of determining if the land is contaminated according to the EPA definition. If the AEC facility site is then selected for development due to its contaminated state, with remediation a clear development goal, then a point may be awarded. However, it is crucial to provide documentation of the steps taken for remediation. No provision for this has been made in the Cost Estimate Detail (Attachment 2 of the DD Form 1391 documentation). CERL contends that there is potential to earn this

credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

- “Alternative Transportation—Alternative Fuel Refueling Stations” (LEED™ Credit 4.3, SPiRiT Credit 1.C4.3)

The A/E firm claims this credit in LEED™, but not in SPiRiT. It is not apparent from the documentation that there are alternative fueling stations or any plans to add to an available fleet using alternative fueled vehicles (hybrid or electric). In a campus-type environment, where the majority of the vehicles travel only short distances on a daily basis, electric cars are very practical. Fueling stations cost approximately \$15,000 each, which are not indicated in the budget. Assuming 270 parking spaces, nine fueling facilities will be needed to attain this credit at an estimated cost of \$135,000. Reducing the total parking capacity will reduce this cost, since fewer fueling facilities will be required. CERL contends that there is potential to earn this credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

- “Reduced Site Disturbance—Protect or Restore Open Space” (LEED™ Credit 5.1) and “Reduced Site Disturbance — Protect or Restore Previously Developed Sites” (SPiRiT Credit 1.C5.1)

The A/E firm claims this credit in LEED™, but not in SPiRiT. Limiting site disturbance is a construction management issue, restricted to specified zones around new construction. The tentatively selected Site 4 has been previously used; therefore, restoration of the site is required by removing the impervious surface. This has not been adequately addressed in the documentation provided by the A/E firm. Additionally, the current depiction for the parking lot is very close to a drainage swale. The current proposition by the A/E firm of cutting down 2½ acres of trees increases site disturbance and costs, and is within neither the spirit nor the intent of this credit. Also, since this is a “showcase” project, all attempts should be made to restore 50% of the previously developed open space on the site. CERL contends that there is potential to earn this credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

- “Reduced Site Disturbance—Development Footprint” (LEED™ Credit 5.2, SPiRiT Credit 1.C5.2)

The A/E firm claims this credit. CERL asserts the building footprint is not actually reduced if the concrete pad is present. However, this credit can be attainable since the site is large and can be left as open space. CERL recommends re-using existing open space, and/or replanting 50% of the remaining open space. As mentioned previously, the current proposition by the A/E firm of cutting down 2½ acres of trees is within neither the spirit nor the intent of this credit.

CERL contends that there is potential to earn this credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

- “Stormwater Management—Treatment” (LEED™ Credit 6.2) and “Stormwater Management—Implement EPA’s Best Management Practices” (SPiRiT Credit 1.C6.2)

The A/E firm claims this credit in LEED™, but not in SPiRiT. Non-point pollution (e.g., phosphorous and sediment) control with appropriate design of site features, paving, and retentions systems should make this credit achievable with no extra cost. Retention systems are already included in the documentation. Another possible consideration is a constructed wetland for stormwater management rather than retention ponds, although ponds could be modified and incorporated as part of stormwater management system. As Maryland is one of the most progressive states in the country regarding phosphorous and sediment control, substantial opportunities exist for implementing this type of control. The state requirement is the 10% rule for Intensely Developed Areas (IDAs). However, options that can achieve 40% or higher phosphorous removal include a number of types of wetlands and ponds, infiltration basins and trenches, sand filters and swales. Detention facilities, dry ponds, biofilters, filterstrips, and open channels are among the options that should not be used, as they cannot achieve the required removals. CERL contends that there is potential to earn this credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

- “Light Pollution Reduction” (LEED™ Credit 8, SPiRiT Credit 1.C8.1)

The A/E firm claims this credit. However, CERL contends that special consideration must be given to fixture selection and placement to achieve requirements for light pollution reduction while considering parking lot tree shading patterns for heat island reduction. The “40 foot high 400-watt Metal Halide Parking lot lighting standards and 100-watt Metal Halide bollards” listed in the documentation may render the light pollution goals infeasible. Shorter standards are normally required to keep light from leaving the site, and to light parking surfaces under and around mature trees. CERL believes that although there is potential to earn this credit, the A/E firm needs to conduct additional planning and consideration regarding the outside lighting fixtures and uses. Specifying proper equipment is crucial for this credit.

- “Optimize Site Features” (SPiRiT Credit 1.C9.1, not a part of LEED™)

The A/E firm claims this credit. Although the DD Form 1391 “Description of Proposed Construction” identifies that minimal grading will be done in the parking lot, this is not enough to garner the point for “optimize site features.” The basic intent is to take advantage, to the maximum extent possible, of the natu-

ral site features for energy reduction, aesthetics, minimal environmental impact, etc. The site sketch currently has the facility conforming to the footprint of the existing building, instead of optimally orienting the building for solar, wind, shading, etc. Reuse of the existing slab will not garner points for “building reuse.” For sustainability goals, it would be desirable to optimally orient the new facility in the given open space, remove and reuse the existing materials from the slab, and restore the damaged areas of the site. In addition, serious consideration should be given to siting the parking lot on existing open space, rather than forested areas. Orientation of the building to accommodate this kind of parking also affords benefits for solar, wind, and shading. The DD Form 1391 documentation should discuss the program for optimizing the site features. CERL contends that there is potential to earn this credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

- “Facility Impact—Cluster facilities to reduce site impact and support mass transit” (SPiRiT Credit 1.C10.1, not a part of LEED™)

The A/E firm claims this credit. CERL does not understand how the facilities are being “clustered” in the scheme. The building is sited independently of other buildings and is bounded by a road, train tracks, and some small forests. CERL does not interpret this as “clustering” and therefore, does not see the potential for earning this credit.

- “Site Ecology” (SPiRiT Credit 1.C11.1, not a part of LEED™)

The A/E firm claims this credit. Removal of 2.5 acres of mature woods is not within the spirit or intent of this credit. Correspondingly, planting trees one-to-one is not sufficient to garner points for “site ecology.” The intent of this credit is to identify and mitigate, to the maximum extent possible, existing problems on the site. Minimizing the facility footprint, siting the building and parking in existing open spaces, and removal of the old warehouse slab would allow maximum protection of existing natural assets and allow restoration of major areas of the site. CERL contends that there is potential to earn this credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

2. Water Efficiency

The credits for this category are typically pushed to the limits when attempting to attain “platinum-rated” buildings. Based on CERL’s review of the documentation, there are several points in this category in which the A/E firm deems these credits

unachievable for this project. However, CERL anticipates the potential to earn these credits with the rationale provided below.

- “Innovative Wastewater Technologies” (LEED™ Credit 2, SPiRiT Credit 2.C2.1)

The A/E firm deems this credit unachievable. However, assuming the project intends to capture rainwater in cisterns, it is a simple matter of reducing or eliminating potable water for sewage conveyance. Achieving 50% reduction in potable water sewage conveyance volumes will earn this credit. Following a baseline analysis for a 30% water use reduction (described below under LEED™ Credit 3.2 and SPiRiT Credit 2.C3.2, “Water Use Reduction—30%), potable water demand is reduced by using alternative toilets, urinals, and appurtenances, potentially resulting in a 50% reduction in sewage. Also, the building should be plumbed for graywater reuse from lavatories and shower facilities that could be reused for toilet flushing. A rainwater roof catchment system could also be tied in for that purpose. If 100% reduction in potable water sewage conveyance volumes is achieved, this would potentially earn an innovation credit as well.

Another possible consideration involves reducing the use of potable water for sewage conveyance by treating the waste on-site with a living machine. It is anticipated that the living machine option would also be a great demonstration tool.

- “Water Use Reduction—30% Reduction” (LEED™ Credit 3.2, SPiRiT Credit 2.C3.2)

The A/E firm deems this credit unattainable. CERL conducted a baseline and design analysis of the project using the LEED™ spreadsheet (Appendix B). It is possible to achieve over 50% reduction by using ultralowflow toilets (for both men and women) and waterless urinals (for men). In theory, infrared sensors on toilets are supposed to help reduce water use, however, these require a lot of fine-tuning and adjustment to ensure flushing only occurs when needed. Conversely, waterless urinals have met great success at many facilities (see <http://www.bricor.com/> and <http://www.falconwaterfree.com/> for more information). In the DD Form 1391 documentation, waterless urinals were removed from consideration because of the misperception that waterless urinal maintenance is more difficult and waterless urinals less aesthetically pleasing compared to traditional products. Currently, waterless urinals are being used at universities, elementary schools, national parks, post offices, and military installations (Annex A2 to Appendix A). After experiencing the minimal maintenance necessary for waterless urinals, many of these institutions have ordered more units and are replacing conventional urinals with waterless ones. According to one of the LEED™ consultants, waterless urinals have been problem-free and have drastically reduced water usage. In addition, they are also one of the

highlights of visitor tours, which may be an important consideration for a show-case building.

CERL recommends using faucet aerators in lavatories and lowflow showerheads in shower facilities. Faucets with either electronic control with no delay on cut-off or mechanical faucets requiring constant pushing on a lever (e.g., State of Pennsylvania Cambria Office Building) should be considered as well as flow reducing aerators that surpass the requirements of the Energy Policy Act (EPACT) of 1992.

In contrast, another team member contends that automatic shutoffs create expensive, unnecessary additional costs. Sinks for janitors and the kitchen can be standard. The DD Form 1391 mentions automatic flush valves and faucets. However, with waterless urinals, flush valves are unnecessary. For faucets, CERL advises reviewing the cost, which may be an extra \$150 each, indicating a poor payback. With rates of \$7.43 per 1,000 gal for water and sewage (and these rates are expected to increase), water efficiency should be a point of emphasis. The savings resulting from such efficiencies will help offset the cost of the dual plumbing systems. Therefore, the building should be plumbed for dual (gray-water) systems to have the capability to use graywater for toilet flushing purposes in combination with roof runoff.

Waterless urinals usually guarantee a point in the Water Efficiency category. By using waterless urinals in combination with the other proposed technologies, both points for water use reduction should be attainable.

3. Energy and Atmosphere

According to the LEED™ checklist completed by the A/E firm, the scoring of this section is unclear. The points total anticipated by the A/E firm in this section (i.e., 8 points) is less than the number of points when computing the anticipated underlying credits. That is, according to the underlying credits, 12 points are deemed achievable by the A/E firm although only 8 total points are claimed. In addition, in several instances in this category, the A/E firm claims credit in either LEED™ or SPiRiT, but not both. First, the A/E firm claims LEED™ Credit 1.3, “Optimize Energy Performance—40% New/30% Existing,” but only claims credit for optimizing energy performance up to 30% for new buildings in SPiRiT Credit 3.C1.1. Second, the A/E firm claims LEED™ Credit 2.1, “Renewable Energy—5%” and LEED™ Credit 2.2, “Renewable Energy—10%,” but does not claim either of these credits in SPiRiT (i.e., SPiRiT Credits 3.C2.1 and 3.C2.2, respectively). Third, the A/E firm

claims LEED™ Credit 6, “Green Power,” but does not claim the corresponding SPiRiT Credit 3.C6.1.

Based on CERL’s review of the documentation, there are several points in this category in which LEED™ and SPiRiT credit attainment remain in question. Each of these points is listed below with the rationale for why the achievement of these points is in question, and whether or not CERL believes there is potential to earn these points for this project.

- “Optimize Energy Performance—30% New/20% Existing” (LEED™ Credit 1.2, SPiRiT Credit 3.C1.1)
- and
- “Optimize Energy Performance—40% New/30% Existing” (LEED™ Credit 1.3, SPiRiT Credit 3.C1.1)

“Platinum-rated” projects are virtually always very energy efficient. CERL suggests the potential for at least 40% savings in energy costs compared to the base case model using ASHRAE Standard 90.1 requirements. The 40% savings qualifies for LEED™ Credits 1.2-1.3, and SPiRiT Credit 3.C1. Analysis of different energy systems using modeling simulations, such as EnergyPlus, are needed to ascertain the possibilities. Although distributed generation is a credit in SPiRiT (Credit 3.C7.1), but not in LEED™, CERL recommends analyzing the use of micro-turbines with heat recovery as part of the energy analysis of the building. (See Appendix C for a description of the EnergyPlus simulation runs.)

Deliberate attention must be given to issues of orientation, massing, fenestration, lighting, and HVAC systems. The apparent lack of consideration to these issues in the currently proposed concept design prevents the attainment of these credits. Since the improvements in efficiency are based on costs, the sources and costs related to these issues are critical.

It is important to note that passive systems, such as dual-paned windows, appropriate R-valued insulation, and the skin of the building, can make a dramatic difference in energy usage for heating and cooling. High-efficiency fluorescent lamps and maximization of natural day lighting are also highly recommended.

Use of UFGS-13801 “Utility Monitoring and Control Systems” (UMCS) has the potential for earning additional points in this category, and thus, is highly recommended. CERL recommends a dual bid approach:

1. Specify interface to existing base-wide UMCS, if there is one, and
2. Specify LonWorks-based or BACnet-based system. The key requirement is an “open” system. The Corps of Engineers is in the process of updating UFGS-13801 to specify LonWorks technology.

A LonWorks or BACnet-based UMCS can optimize system performance in several respects:

1. Cost effective, energy efficient, and environmentally-friendly control hardware can be selected from multiple vendors.
2. The system can be designed to provide occupant access to the environmental control system via web-browser for viewing of environmental sensor readings and, should it be so desired, environmental control system setpoint adjustment.
3. IAQ sensor readings can be monitored and stored for later retrieval/review (CO₂, CO, humidity, temperature, VOCs, etc.).
4. The systems includes a Dry-bulb economizer (for MAU and possibly for heat pump).
5. The systems interfaces with fire and security systems (is compatible with LonWorks).
6. The systems employs Measurement and Verification using detailed HVAC controls and UMCS specification.
7. The systems can schedule start/stop to accommodate building/office occupancy.
8. The systems uses thermostats with unoccupied mode override, to provide for after-hours start up of heat pumps (which are used in conjunction with scheduled start/stop).

Items 4, 7, and 8 can be incorporated as part of a local/ordinary control system (not part of a more sophisticated and expensive “UMCS” with data collecting capability and a user/operator interface).

Only 12 of the possible 20 SPiRiT points (cf. Table 2) are claimed for the Credit “Optimize Energy Performance.” The rationale for distribution/breakdown for the 12 points is not known, but a UMCS should provide the potential for additional points for this credit.

- “Renewable Energy—5%” (LEED™ Credit 2.1, SPiRiT Credit 3.C2.1) and
- “Renewable Energy—10% (LEED™ Credit 2.2, SPiRiT Credit 3.C2.2)

The A/E firm claims LEED™ Credit 2.1 “Renewable Energy—5%” and LEED™ Credit 2.2 “Renewable Energy—10%,” but does not claim either of these credits in SPiRiT (i.e., SPiRiT Credits 3.C2.1 and 3.C2.2, respectively). CERL does not believe there is the potential to earn these credits. To earn one point, the project would have to supply 5% of the building’s energy from renewable energy tech-

nologies. Ground source heat pumps and passive solar elements are considered under criteria in LEED™ Credits 1.1-1.5 “Optimize Energy Performance” and in SPiRiT Credit 3.C1 “Optimize Energy Performance.” Thus, active solar and wind energy are the remaining concepts to be considered with respect to renewable energy credits. Even if the project were located in a good wind resource area, putting up a wind turbine large enough to supply 5% of the needed energy is not economically feasible. For additional analysis, see the comment regarding credit 3.C2 (by Ducey) in Appendix A (p 53), in the section titled “Renewable Energy.”

The A/E firm proposes to keep the concrete pad as the actual/conceptual “platform” aspect of the project to provide support for plug and play solar panels and emerging technologies not yet considered. The A/E firm contends that the platform will permit building of solar arrays by connecting them to the concrete slab in lieu of building a new footing for each array element. CERL asserts that since the project is located in an area relatively low in solar resource, a photovoltaic (PV) power system would be too large and much too expensive. In addition, there would be heat island concerns if the PV system is never installed. Solar hot water would not be cost-effective, since it is competing against natural gas-fired hot water heaters (and hot water requirements comprise only a small portion of the building energy load in any case).

- “Green Power” (LEED™ Credit 6, SPiRiT Credit 3.C6)

The A/E firm claims LEED™ Credit 6, “Green Power,” but not the corresponding SPiRiT Credit 3.C6.1. To determine the potential for earning the “Green Power” credit, the availability of obtaining green power in the area must be ascertained. If Maryland has undergone utility deregulation, AEC would not necessarily have to purchase all of its electricity from the local utility. If green power is available, it must be contracted for a specific amount for a specific time. It generally costs a premium based on 100 kWh blocks. However, the Army is encouraging its facilities to purchase green power, where possible, and might even subsidize any cost differential. In addition, CERL conducted an analysis of Phosphoric Acid Fuel Cell (PAFC) and determined that the fuel cell project is not economically feasible for the proposed project (Appendix D). CERL contends that there is potential to earn this credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

4. Materials and Resources

In this category, the A/E firm claims LEED™ Credit 1.1, “Building Reuse—Maintain 75% of Existing Shell,” but does not claim the corresponding SPiRiT 4.C1.1.

Based on CERL’s review of the documentation, there are several points in this category in which LEED™ and SPiRiT credit attainment remain in question. Each of these points is listed below with the rationale for why the achievement of these points is in question, and whether or not CERL believes there is potential to earn these points for this project.

- “Building Reuse—Maintain 75% of Existing Shell” (LEED™ Credit 1.1, SPiRiT Credit 4.C1.1)

CERL contends that this credit is unattainable based on the present A/E plans and that the potential to earn this credit is impractical. This credit is entirely based on calculations and pre- and post-construction plans. Seventy-five percent reuse of an old building is a considerable amount, particularly since there is likely to be a lot of lead and asbestos. The lead and asbestos will continue to be a health hazard to maintenance workers and possibly to building users.

- “Resource Reuse—Specify 10%” (LEED™ Credit 3.2, SPiRiT Credit 4.C3.2)

Resource reuse credits require the use of salvage materials and are based on the dollar value of the materials purchased for the project. Approximately 20% of the projects submitted for LEED™ certification earn the LEED™ Credit 3.1 that requires salvaged or refurbished material for 5% of the building materials. However, only approximately 5% of the projects also attain the credit for reusing 10% salvage materials (i.e., the credit under debate). It is questionable whether the partial reuse of the foundation, steel framing, and wood roof decking from Building E1890 will meet the percentage requirements for SPiRiT and LEED™ credits. This is especially true if the specified reuse materials fail testing required to ensure their structural integrity.

CERL recommends specifying salvaged or refurbished materials to the greatest extent feasible, not just those associated with Building E1890. Consider partnering with area demolition and salvage companies for access to salvage material stockpiles. Some military installations have begun to amass material salvaged from their own renovation and demolition programs. Partnering with these installations is encouraged. Commonly salvaged building materials include brick, masonry, framing lumber, heavy timbers, wood flooring, millwork, doors, plumbing and lighting fixtures, hardware, mantels, and ironwork. In addition, demolition waste for reuse may be available via websites or local buildings being remodeled or demolished. It is not the easiest credit available, but a

worthwhile idea if the manpower is available to pursue it. CERL anticipates the potential to earn the credit for reusing 10% salvage materials, although follow-up by the A/E firm on these comments and additional documentation are necessary.

- “Recycled Content—Specify 50%” (LEED™ Credit 4.2, SPiRiT Credit 4.C4.2)

Although most of the projects submitted for LEED™ certification earn LEED™ credit 4.1 “Recycled Content—Specify 25%,” only approximately one-quarter of the projects submitted earn the more stringent LEED™ credit 4.2. Achieving this particular credit may largely depend on the types of materials chosen for the building, as some avail themselves to recycled content more than others. The only recycled content building product currently specified explicitly is the crumb rubber to be used at the service access road. The design team should provide the percentages of post-consumer and post-industrial products used. This credit will also rely on how the specs are written. Minimum recycled contents should be specified in the specs to ensure enough recycled content will be incorporated into the building. Common building materials and products with recycled content include: wall, partition, and ceiling materials and systems (e.g., structural fiberboard, laminated paperboard, and restroom toilet partitions); insulation; tiles and carpets; reinforcing metals; structural and framing steel; latex paint; and furniture. The use of fly ash to replace some percentage of the cement in the concrete is generally cheaper and counts toward recycled content. It should also be noted that many companies are improving the design of their product lines to reduce the impact of manufactured goods on the environment. One approach is modular, upgradeable, recyclable, and remanufactured components.

The calculation for this credit involves the recycled content based on weight percentages for the material itself and then multiplying this percentage by the cost of the material. The recycled content percentage rate is then computed by calculating the ratio of the recycled content dollar value to the total materials cost. CERL anticipates the potential to earn this credit, although follow-up by the A/E firm on these comments and additional documentation are necessary.

5. Indoor Environmental Quality

In this category, the A/E firm claims SPiRiT Credit 5.C6.2, “Controllability of Systems—Non-Perimeter,” but does not claim the corresponding LEED™ Credit 6.2.

Based on CERL's review of the documentation, there are several points in this category in which LEED™ and SPiRiT credit attainment remain in question. Each of these points is listed below with the rationale for why the achievement of these points is in question, and whether or not CERL believes there is potential to earn these points for this project.

- “Controllability of Systems—Non-Perimeter” (LEED™ Credit 6.2, SPiRiT Credit 5.C6.2)

The A/E firm claims SPiRiT Credit 5.C6.2, but does not claim the corresponding LEED™ Credit 6.2. Provision of individual occupant controls over thermal, ventilation, and lighting systems may not be as simple as indicated in the DD Form 1391 documentation. At a minimum, any special provisions for these controls need to be reflected in project costs. Operable windows are generally not included in typical administrative buildings and, correspondingly, are typically not included in Exterior Closure cost per square foot. Costs for operable windows are not apparent in the detailed cost estimate unless they are included in “Exterior Aluminum Windows.” CERL recommends that the A/E firm confirm inclusion and quantity in the cost estimate per square foot.

Similarly, individual controls over airflow and temperature typically come at a higher price, especially for cubicles in an open plan office space. Again, these control costs are not included in typical administrative buildings cost per square foot. A general statement indicating that the project will include individual thermal controls for personal comfort is made in the DD Form 1391 documentation, but cost and/or special systems requirements for this are not evident. Note that the single line item in the A/E-prepared detailed cost estimate for HVAC systems controls is the standard TRACES cost per square foot for an administrative facility, and is inadequate in and of itself. However, allowance has been made for individual controls under the detailed line item “HVAC Air Distribution.” Manually adjustable floor diffusers may meet the cooling and airflow requirements, but may not meet the heating requirement. The quantities of the various control methods, e.g., “Under Floor Air diffusers,” “Power & Control Modules,” and “Thermostats” seem inconsistent in quantity required/Occupant. CERL recommends that the A/E firm confirm quantities necessary to achieve credit in LEED™ and SPiRiT, and verify their inclusion in the cost estimate.

CERL anticipates the potential to earn this credit although more emphasis is required for controllability of the systems in the interior zones. Building layout and orientation can positively affect the ability to earn this credit. CERL recommends a new layout that allows for maximum user control of the work environment. Although there is potential to earn this credit, follow-up by the A/E firm on these comments and additional documentation are necessary.

- “Daylight and Views — Daylight 75% of Spaces” (LEED™ Credit 8.1, SPiRiT 5.C8.1)
and
- “Daylight and Views — Views for 90% of Spaces” (LEED™ Credit 8.2, SPiRiT 5.C8.2)

The A/E firm claims each of these credits in LEED™ and SPiRiT. Building layout and orientation can positively affect the ability to earn the credits for daylighting and views. Daylighting in offices has been shown to improve employee production and attendance significantly. Although daylighting strategies were addressed to a limited extent in the DD Form 1391 documentation, the concept design layouts, site orientation, and overall concept configuration do not appear to be optimized for daylight penetration into either open plan office spaces, or what are assumed to be “hard walled” interior office spaces. Direct line of sight may be similarly restricted, albeit, to a lesser extent. Achieving views may require some use of glazing in interior walls. If concept design drawings are to become a part of the detailed DD Form 1391 documentation, they should be more indicative of the anticipated/desired facilities siting, orientation, and configuration. The current layout will probably not achieve either of these credits, as the design is too deep. However, light shelves and atriums will help, if a deep design is required. Although CERL contends there is potential to earn these two credits, building layout, site orientation, and overall concept configuration need to be revised by the A/E firm.

6. Innovation and Design Process

This category is a part of LEED™, but is not included in SPiRiT. The LEED™ points in this category that remain in question are:

- Credits 1.1-1.4, “Innovation in Design.”

CERL anticipates the potential to earn these credits, although it should be emphasized that innovation credits are not easily obtainable. The intent is to greatly exceed an existing credit or do something that is truly innovative. As such, the determination as to whether an innovation credit is appropriately earned is reviewed first on the basis of whether that which is claimed is covered under existing criteria. The current documentation provided by the A/E firm does not provide evidence for award of innovation credits. However, CERL recognizes that this project is in the very early stages of an ongoing process, with only the planning charrette completed thus far. Therefore, the potential exists for innovation design credits for this project.

Examples of potential innovation credits include potable water-free sewage conveyance, design process documentation, public and end-user education, and 40% or higher replacement of cement with fly-ash.

7. Facility Delivery Process

This particular category is part of the SPiRiT scoring criteria, but is not a part of LEED™. CERL concurs with the A/E firm that all potential credits in this category are attainable.

8. Current Mission

This particular category is part of the SPiRiT scoring criteria, but is not a part of LEED™. CERL concurs with the A/E firm that all potential credits in this category are attainable.

9. Future Missions

This particular category is part of the SPiRiT scoring criteria, but is not a part of LEED™. CERL concurs with the A/E firm that all potential credits in this category are attainable.

4 Assessing the Preliminary DD Form 1391

The preliminary DD Form 1391 must be assessed to determine if it has been appropriately prepared and contains language and detailed cost estimate to secure approval for the project by the higher chain of command. Each project DD Form 1391 is reviewed and approved by a sequence of review offices. Figure 1 outlines the process.

A contractor is developing the DD Form 1391 for the AEC HQ Administration Building (Project Number 59667). It must first be reviewed and approved by the customer (AEC) and installation planners (Aberdeen Proving Ground). Upon completion of the DD Form 1391, the form is electronically submitted to the Region (Northeast Region Office [NERO]). The Region secures the review and certification of the project form from the supporting Corps of Engineers Division (North Atlantic Division [NAD]) and from the Information Systems Engineering Command Fort Detrick Engineer Office (ISEC-FDEO). NAD will review the project for technical adequacy and compliance with Army guidelines. See Appendix E for NAD's DD Form 1391 Guide for USACE Certification. (This guide is being considered by USACE for distribution to other USACE Districts.)

Upon review by NAD and ISEC-FDEO, the Region will complete reviews, certify the form and submit electronically to HQDA, Assistant Chief of Staff for Installation Management (ACSIM). At the time of the submittal, a copy of the form is permitted (read only) to the HQ, Installation Management Agency (HQ, IMA) and to HQ, U.S. Army Corps of Engineers (HQUSACE). HQ, IMA will review and provide comment to ACSIM. The project will be presented to the Military Construction, Army (MCA) Construction Requirements Review Committee (CRRC) at the FY 2006 MCA Project Review Board (PRB) in March 2003. HQDA Staff representatives will review the project and determine its priority ranking relative to Army construction priorities.

Several members of the CERL project team have been contacting appropriate project reviewers to discuss the AEC project, sustainable design and development goals, use of SPiRiT during a project, issues, and the desired DD Form 1391 contents and format. These discussions have taken place with reviewers at various offices listed above.

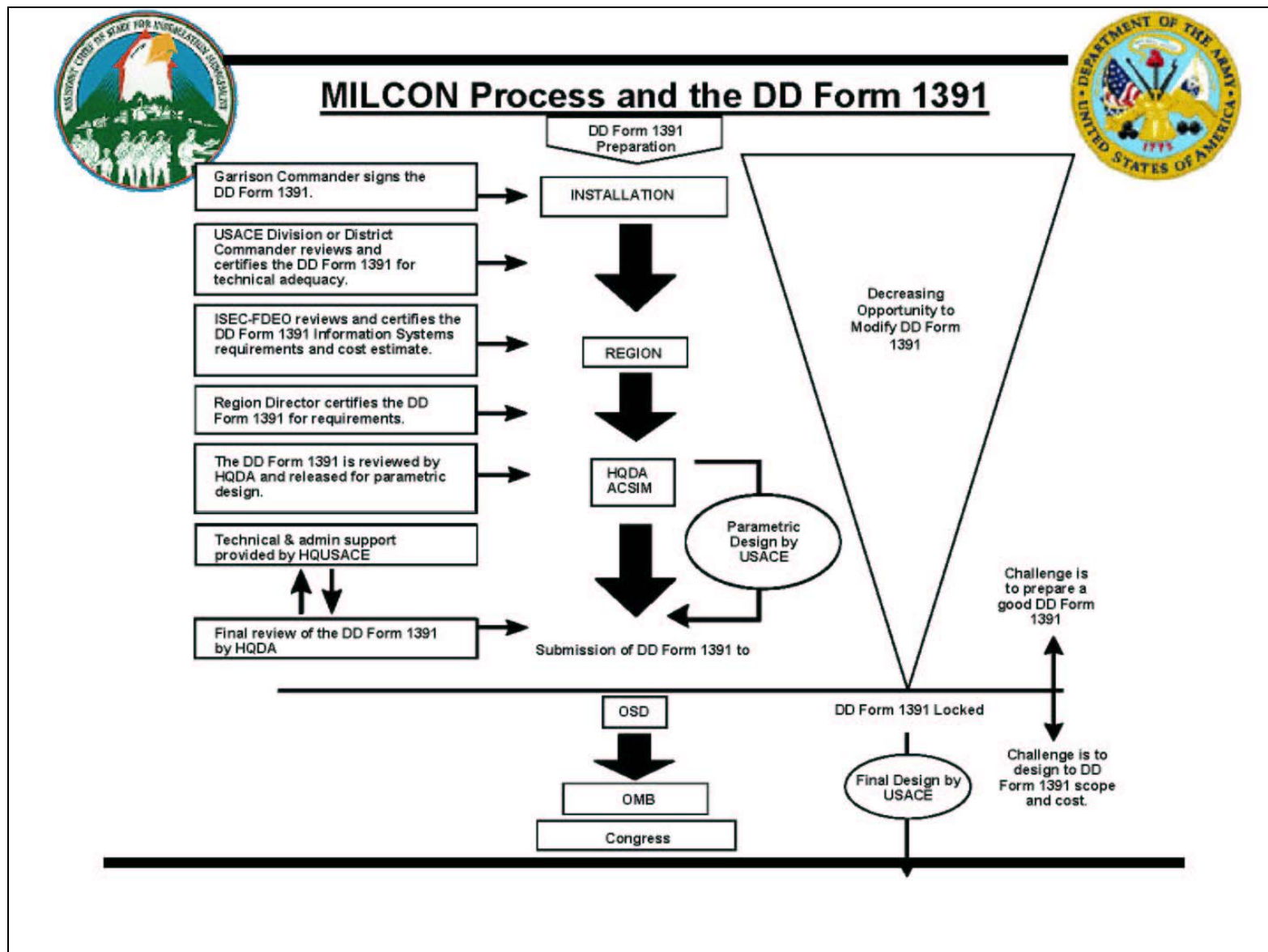


Figure 1. Process used to assess the 1391 document.

The reviewers are very interested in sustainable design and development and SPiRiT, but there is not really a consensus on how best to justify and estimate costs for a “showcase” project. During one of these discussions, the following was put forth. Sustainable design is largely a matter of good design, carefully chosen materials and systems, particularly mechanical systems. It is also a matter of putting sufficient information in the DD Form 1391, particularly in Tab J, for the designer to properly design the building, and having enough money in the estimate to cover the construction.

The Showcase projects currently programmed have been selected by ACSIM and HQUSACE. These projects may be allowed some increase in funding to incorporate special sustainable features if the features can be justified appropriately. However, reviewers expressed the following concerns:

1. There is always a concern (flag raised) if the “supporting facilities” cost more than 25% of the primary facility. The cost would need to be explained in the “Description of Proposed Construction” section of the DD Form 1391. (For example, the steam line is a big-ticket item in the “Supporting Facilities.”)
2. There are typical allowable costs per square foot for various facility types. These are set by OSD (Office of Secretary of Defense). Unit costs must NOT exceed the price caps. It is suspected that this project will run into those price caps, and the instinct of the reviewers is to ask hard questions on WHY it costs more. Therefore, this project will have to devise a statement showing high-level support and justifiable costs. ACSIM has identified “Showcase” projects that it wants to support. This project is of interest to ACSIM.

During the CERL in-progress review conducted at AEC on 23 January 2003, the AEC project team, comprised of the A/E firm and APG personnel, decided to break out the various space types and develop a cost per square foot for each. This will help considerably, because it is generally accepted that high-tech computer spaces and well-equipped training spaces cost more per square foot compared with conventional administrative spaces. It is anticipated that this project can be built for a price comparable to a well-designed LEED™ building. As CERL presented during the in-progress review, LEED™ “silver-rated” buildings can typically be built with no additional cost. “Gold-rated” buildings can be built for 2 to 3 percent additional cost, and “platinum-rated” buildings are more difficult to attain because discretion of the credits is reduced and expensive alternatives must be pursued. One of the preferred methods to achieving a “platinum-rated” building is to earn as many points as possible with respect to the energy, water, and innovation credits.

3. The front page of the DD Form 1391 must be clear, succinct, and easy to read. The front page must be able to communicate the need of the project clearly to all levels of review, including OSD and Congress. The original front page of the DD Form 1391 is much too complicated. The IMA Northeast Region reviewer modified the front page 1391 so that it is much easier to read, and put all the complicated details of the proposed sustainable building in Tab C General Justification Data. (See Appendix F.)

It is the belief of HQUSACE and ACSIM that a bronze or silver SPiRiT rating can be achieved without additional funding to the project. Higher ratings may require additional funding and will be reviewed for each project being considered. ACSIM is interested in improving the sustainability of their facilities and the environment, and, to this end, are supporting “Showcase” projects. This is the first project CERL is aware of that is attempting to become “platinum-rated,” aside from the Straw Bale classroom at Fort Hood, TX.

Appendix G includes CERL comments regarding the text of the DD Form 1391 document and the corresponding cost estimate details prepared by the A/E firm.

5 Conclusions

Based on CERL's analysis, the application of LEED™ and SPiRiT to this proposed building design will obtain 36 points according to the LEED™ criteria, which is 15 points less than needed to achieve a Platinum Rating. However, there is potential for 22 additional points that represent: (1) credits anticipated by the A/E firm, but not addressed or documented sufficiently based on CERL's review, or (2) potential credits that CERL anticipates should be attempted, and could be earned, that were not deemed achievable by the A/E firm. Thus, this project has the potential to earn 58 points based on LEED™ criteria. (LEED™ criteria are based on a 69-point scale, in which "platinum-rated" buildings must score a minimum of 52 points.)

Based on CERL's analysis, the project will obtain 62 points according to the SPiRiT criteria, which is 13 points less than needed to attain a Platinum Rating. However, there is potential for 24 additional points that represent: (1) credits anticipated by the A/E firm, but not addressed or documented sufficiently based on CERL's review, or (2) potential credits that CERL anticipates should be attempted, and could be earned, that were not deemed achievable by the A/E firm. Thus, this project has the potential to earn 86 points based on SPiRiT criteria (which are based on a 100-point scale).

Within CERL's detailed analysis described in Chapter 3, "Analysis of Proposed Credits for LEED™ and SPiRiT Criteria" are focused questions and/or comments that must be considered and addressed by the A/E firm, as the project moves forward, to maintain the potential to attain "platinum-rated" status in both LEED™ and SPiRiT. A few of the most pressing concerns presented by CERL based on the currently proposed concept design include the siting (including removal of 2½ acres of trees), orientation, massing, fenestration, lighting, and HVAC systems.

Appendix A: CERL Review Comments Organized by SPiRiT Credits

Comments Organized by Sustainable Project Rating Tool (SPiRiT) Credits

General Review Comments

Schneider Costs for LEED™ project registration and certification with the U. S. Green Building Council (USGBC) need to be included in the project budget. While these costs are not strictly 'design' related, I recommend that they be included under Tab B, "Planning and Design Data" as 'All Other Design Costs.'

USGBC fees have recently been restructured so that they are based on project scope. Member fees for facilities between 75,000 and 300,000 SF for registration are \$0.01/SF and for certification are \$0.02/SF or \$955 and \$1910 respectively for the current scope of 95,500 SF.

Registration/Certification instructions are offered at LEED™
<http://www.usgbc.org/LEED™/Register.asp>.

Additional design cost should be budgeted for documentation required to support the certification process and included in the project budget. While these costs are 'design' related, they are considered 'additional' and I recommend that they also be included under Tab B, "Planning and Design Data" 'All Other Design Costs.'

General – Spell check! SPiRiT and not "SPiRiT."

While not a 1391 comment per se, SPiRiT/LEED™ points may be achievable for 'Brownfield Redevelopment.' Although contaminated lands on military installations are not classified as brownfields under the EPA's Brownfield Redevelopment program requirements, lands where pollutants, hazardous materials, and contaminants are present that would designate it as a brownfield according to the EPA definition are considered 'brownfields' for under SPiRiT/LEED™. The Aberdeen environmental office can identify those lands that are contaminated and the nature of that contamination for the purposes of determining if the land is contaminated according to the EPA definition. If the AEC facility site is selected for development due to its contaminated state with cleanup a clear development goal then a point may be awarded.

Pelle-
grin/LEED™

Tracking and Documenting LEED™

Tracking the LEED™ documentation is key to receiving the Platinum award. It is very important to keep all documentation organized and know what is happening on and off the construction site. Here are some ideas for the person or persons in charge of tracking the LEED™ points and proper documentation:

Whoever is responsible for tracking the documentation must be sure that they start documenting from the beginning. I recommend a loose-leaf binder with all the spec numbers listed. This way as the project goes along, the assigned person can look through the submittals as the design team signs off and copy the ones of value for the final LEED™ binder. When it is time to submit all LEED™ documentation, the person can guarantee that all the information needed is in this one particular binder.

The person responsible for gathering the documentation for LEED™ should also visit the construction site regularly to confirm that the demolition and construction waste is properly disposed of and to ensure that all contractors are complying with specs and LEED™ /SPiRiT standards. I have attached a Construction Waste Management Plan (Annex A1) to show an example of what is expected of the contractors. Using this plan, 93% or more of construction waste can be recycled.

The spec writer should have previous experience writing "green" specifications. It will be necessary for the specs to be more specific than typical specs (i.e., include required certified recycled content, specify EPA guideline compliance, require MSDS sheets, specify green seal requirements and Forest Stewardship Certified (FSC) wood.) If no spec writer with "green" experience is available, then the spec writer should, at an absolute minimum, have enthusiasm for and be internally motivated by the "greening" goals of the project. Make sure they are written well so that there are no disagreements between the owner, design team, or contractor. In my experience, discrepancies and inconsistencies in the specs will result in delays, change orders, and increases in project costs.

Pelle-
grin/LEED™

Review of LEED™ checklist for additional points and evaluation of planned points

Based on my experience with LEED™ buildings, I would suggest finding ways to get more points than 54. If 52 points is a Platinum level, there is only 2 points to spare. It is very questionable whether some of these points will be accepted by the USGBC. They are very strict about giving points in the Innovation section. These credits are awarded only to very innovative designs. Review other projects that received innovation credits to get an idea of what the scope of work entailed for an innovation credit.

Pelle-
grin/LEED™

Energy and Atmosphere

There is an ambiguity in how the points here were counted. While 9 credits are listed with "yes" next to them, the Checklist counts only 8 points as being achieved.

Pelle-
grin/LEED™

Innovations & Design Process

Although several possible innovation credits have been proposed (i.e., a clear spanned conference room, day-lighting auditorium, existing steel frame arbors, landscaping as force protection, plug and play "platform" concept), none of them are likely to be accepted. While they are all great ideas that should be integrated into the design, these ideas are not either original enough or effective enough to qualify for credits. The use of steel frame arbors would qualify as part of the reuse of materials. Similarly, day-lighting the auditorium will assist with the credit for day lighting and views. The "plug-and-play platform" concept is inherent in the LEED™ program, which is encouraging the use of the latest technology to improve building sustainability. Also, the awarding of innovation credits is very subjective and relatively difficult to attain.

One possible innovation credit for this project would be to humidify the air using a fountain or waterfall in the atrium. Similar systems have been used to dehumidify air, so by creating a more energetic fountain, microdroplets of water (mist) should be added to the air rather than removed from it. When the ambient humidity outside is higher than desired, the fountain would function as a dehumidifier. Using a fountain or waterfall for this purpose would create both a more beautiful atrium and also remove the noise and complications associated with traditional humidifying systems. Since the water is being cycled continuously, it would not significantly add to the water load in the building. Ideally the water used to supplement the fountain should be supplied from the cisterns.

Another possible innovation credit would be to add a drip system that would transfer any overflow storm water from the cisterns directly to the water table. Current plans imply that any overflow of storm water from the cisterns will be directed to the treatment facilities. However, this water is already mostly pure. We suggest that by adding a small gutter around the edge of the cisterns attached to a gravity-fed drip system buried below the landscape, the overflow water will be transferred directly to help recharge the groundwater table and improve water absorption rather than being dumped on a treatment system already overloaded with rainwater from other sources.

Webster

Other Materials and Resources Strategies

- Maximize use of products that reduce material use such as drywall clips, engineered stair stringers, and pier foundation systems. An interesting example is warm concrete pigments used to make exposed concrete wall and floor surfaces more appealing. This in turn reduces the amount of required additional wall and floor treatments (e.g., wood and carpet).
- Maximize use of durable products and/or low maintenance requirements (e.g., fiber-cement siding, fiberglass windows, slate shingles, and vitrified clay waste pipe).
- Maximize use of products that minimize operational pollution and waste (e.g., Vending Misers that optimally control the operation of vending machines, EPA Energy Star rated appliances, compact fluorescent lamps designed to fit into regular incandescent lamp fixtures, and high-efficiency light emitting diode (LED) applications).
- Maximize use of products and strategies that reduce heating and cooling loads (e.g., structural insulated panels, insulated concrete forms, autoclaved aerated concrete blocks, components with recycled-content foam insulation, high-efficiency double glazing with low-emissivity coatings, vegetated roofing systems, reflective roofs, luminaires with heat removal and heat recovery capabilities, ceiling-mounted extractor fans with electronic operators controlled by a building management system, and designed entry vestibules that minimize air infiltration).
- Maximize use of products that reduce new construction impacts (e.g., erosion-control products, less invasive foundation products, and exterior stains).
- Maximize use of strategies to reduce renovation impacts. One way is to extend the leasing concept to a broader range of materials, fixtures, and appliances.
- Ensure that future maintenance (e.g., painting), upgrades, and renovations specify materials that comply or improve on the original sustainable design intent.

Webster Materials

- Maximize use of products that remove pollutants/contaminants (e.g., filters, radon mitigation equipment, and ventilation products that optimize air exchange).
- Maximize use of products that warn occupants of hazards (e.g., carbon monoxide detectors; CO₂, total volatile organic compounds, and particulates monitors; and lead paint test kits).
- Maximize use of products that release minimal pollutants (e.g., zero- or low- volatile organic compounds (VOC) adhesives and caulks, paints and coatings, carpet systems, and non-formaldehyde manufactured wood products). Select furnishings and cabinetry with no VOC off-gassing. Use least toxic housekeeping products.
- Maximize use of products that block contaminants such as duct mastic, coated duct board, and linoleum.
- Maximize use of mold-resistant materials.
- Employ exterior sun shading and window treatments.
- Maximize use of products that improve interior light quality (e.g., tubular skylights, specialized commercial skylights, fiber-optic daylighting systems, and full-spectrum lighting systems).
- Improve interior lighting by specifying translucent/transparent/low interior partitions, as well as colors and finishes with high reflectance values to help rooms appear brighter (lighter finishes reflect light, while darker finishes absorb light).
- Specify occupant controlled ventilation and lighting.
- Specify insulation and materials/furnishings with sound-absorbing and noise source isolation qualities.

Webster Design

- Locate building outdoor air intakes away from potential pollutants/contaminant sources.
- Specify designated smoking areas outside the building in locations where ETS cannot reenter the building or ventilation system and away from high building occupant or pedestrian traffic.
- Maximize integration of daylighting through use of vertical fenestration, light shelves, clerestories/monitors, and building form.
- Design spaces to ensure that the direct line of sight to vision glazing is available from 90% of all regularly occupied spaces.
- Design spaces to ensure appropriate acoustical layout.
- Isolated fan compartments with perforated liners and airfoils in the HVAC units to reduce noise pollution.

Webster Comments on Budgets

According to the Planning Charrette Report, general sustainable design and development cost factors in the DD Form 1391 are based on LEED™ certified projects from the HOK Guidebook to Sustainable Design 2000. Two things should be noted:

If not already revised, the 2000 HOK data should be updated using inflationary factors.

Costs between baseline LEED™ certified projects and Platinum-level projects vary widely.

If HOK has data for Platinum-level projects only, these figures (adjusted for inflation) should be used in lieu of the 2000 general LEED™ certified data. It is assumed that the HOK figures were used due to the difficulty in assembling line item cost figures for suggested strategies when no actual building design exists to indicate material quantities. For this same reason, product inclusions, quantities, and costs are unknown at this time.

1.0 Sustainable Sites

1.R1 Erosion, Sedimentation, and Water Quality Control (1)

Intent: Control erosion and pollutants to reduce negative impacts on water and air quality.

Requirement: ☐ Design a site sediment and erosion control plan and a pollution prevention plan that conforms to best management practices in the EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-833-R-92-001, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent. The plan shall meet the following objectives:

- Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
- Prevent sedimentation of storm sewer or receiving streams and/or air pollution with dust and particulate matter.
- Prevent hazardous material discharge into storm water systems.
- Prevent petroleum oils and lubricants (POL) discharge into storm water systems.

Technologies /Strategies: The EPA standard lists numerous measures such as silt fencing, sediment traps, oil grit separators, construction phasing, stabilization of steep slopes, maintaining vegetated ground cover and providing ground cover that will meet this prerequisite.

Comments

1.R1.1

Johnson/
Stumpf 1.R1.1 OK - be sure to include Sedimentation, Erosion, and Pollution Control plans for credit.

1.C1 Site Selection (1)

Intent: Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site. Select site based on functional adjacencies/relationships and land use compatibility.

Requirement: ☐ Do not develop buildings on portions of sites that meet any one of the following criteria:

- Prime training or maneuver land.
- Land whose elevation is lower than 5 ft. above the 100-year flood elevation as defined by FEMA.
- Land that provides habitat for any species on the Federal or State threatened or endangered list.
- Within 100 ft of any wetland as defined by 40 CFR, Parts 230-233 and Part 22, OR as defined by local or state rule or law, whichever is more stringent.

☐ Select site based on functional adjacencies/relationships and land use compatibility.

- Select sites close to existing roads and utilities or use an existing structure to minimize the need for new infrastructure.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

- Select site in area of high density.
- Site facilities based on the strength of their relationships to other facilities/land-uses to limit travel distances. The stronger the relationship/functional interaction, the closer the distance between two facilities.
- Select for distance to installation/base transit systems and access to pedestrian ways and bike paths.
- Select for development previously used or developed suitable and available sites.

Technologies /Strategies: Screen potential building sites for these criteria and/or ensure that these criteria are addressed by the designer during the conceptual design phase. Utilize landscape architects, ecologists, environmental engineers, civil engineers, and similar professionals for the screening process. New wetlands constructed as part of stormwater mitigation or other site restoration efforts are not affected by the restrictions of this prerequisite.

Comments

1.C1.1

Loechl/Tooker Pedestrian and bicycle paths are important site features, that may or may not exist in and around Aberdeen Proving Ground or the selected site, nor may they be included in Aberdeen master plans. Regardless, this project should either do what it can to promote such paths and or accommodate them if and when they are developed.

Need documentation that the development site is clear of the 100-year floodplain and that the Environmental Assessment (EA) will determine the presence of threatened or endangered species.

Need more language to support the credit for functional adjacency and land use compatibility. The design charrette on 1 Nov 2002 may have done this but it is not described in the 1391.

Pelle-grin/LEED™

Credit 1 – Site Selection –

This credit seems promising since the proposed construction will enhance the site. Old, inefficient buildings are being decommissioned and removed. The priority of this project is to set a standard for the APG campus, both in look (i.e., landscaping, design) and efficiency (water use, energy use, energy sources, materials). From the information provided, all the proposed sites should be appropriate.

1.C2

Installation/Base Redevelopment (1)

Intent: Channel development to installation/base cantonment areas with existing infrastructure, protecting greenfields and preserving habitat and natural resources.

Requirement:

- ☐ Increase localized density to conform to existing or desired density goals by utilizing sites that are located within existing cantonment areas of high development density.
- ☐ Select sites close to existing roads and utilities or use an existing structure to minimize the need for new infrastructure.

Technologies /Strategies: During the site selection process give preference to previously developed sites with installation/base cantonment redevelopment potential such as facility reduction program cleared sites.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Comments

- 1.C2.1 Johnson/Stumpf 1.C2.1 The increase of "localized density" is not shown or discussed in this planning document. This credit is rather interpretable to begin with, but the spirit of the credit is to encourage greater development density. The site chosen for this new building does not increase density, as it is merely re-building on an existing site. Additionally, this portion of the cantonment area is not particularly dense.
- Pellegrin/LEED™ Credit 2 – Urban Redevelopment
- This credit is not possible for any of the sites suggested. Based on the building's size (95,500 square ft), the maximum site size would be 1.59 acres. The corresponding site radius, assuming no other buildings, is 790 ft from the center of construction. While this is theoretically possible since the diameter slightly exceeds the indicated dimensions of the building, it would completely impractical.

1.C3 Brownfield Redevelopment (1)

- Intent: Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.
- Requirement: ☐ Develop on a site classified as a brownfield and provide remediation as required by EPA's Brownfield Redevelopment program requirements OR Develop a brownfield site (a site that has been contaminated by previous uses).
- Technologies /Strategies: Screen potential damaged sites for these criteria prior to selection for rehabilitation.
- Utilize EPA OSWER Directive 9610.17 and ASTM Standard Practice E1739 for site remediation where required.

Comments

- 1.C.3.1 See General comment above.
- Loechl/Tooker Brownfield designation is not clear as no report from the EPA is mentioned even though the entire facility is considered a SuperFund site. Such a designation may exist to which a credit can be given for redevelopment.
- Pellegrin/LEED™ Credit 3 – Brownfield Redevelopment
- To get this credit, the site must be classified as a brownfield site according to the EPA definition. Since Edgewood is classified as a superfund site, this should not be a problem. This certification can come from either a local regulatory agency or the regional EPA office. It seems likely that either the mustard gas site or the white phosphorous site would qualify as brownfields. In addition, the perceived non-potability of water at the site may be the basis for getting it classified as a brownfield site.
- However, to get this credit, the site must be remediated (i.e., clean up and/or stabilize the contaminants). Again, it is crucial to provide documentation of the remediation steps taken. No provision for this has been made in the Cost Estimate Detail in the DD Form 1391 documentation.

1.C4 Alternative Transportation (1)

- Intent: Reduce pollution and land development impacts from automobile use.
- Requirement: ☐ Locate building within ½ mile of installation/base transit systems.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

- ☐ Provide suitable means for securing bicycles, with convenient changing/shower facilities for use by cyclists, for 5% or more of building occupants.
- ☐ Locate building within 2 miles of alternative-fuel refueling station(s).
- ☐ Size parking capacity not to exceed minimum installation/base cantonment requirements AND provide preferred parking for carpools or van pools capable of serving 5% of the building occupants, OR, add no new parking for rehabilitation projects AND provide preferred parking for carpools or van pools capable of serving 5% of the building occupants.

Technologies /Strategies: Select sites near public installation/base transit served by safe, convenient pedestrian pathways.

Comments

1.C4.1 Schneider	Bicycle lots are not a normal site feature for administrative facilities. Recommend that they be identified as a requirement and cost or a separate line item be listed under 'Site Improvement/Demolition.' No costs are found in the detailed cost estimate.
1.C4.2 Schneider	Showers are not a normal requirement in administrative facilities. Recommend that they be identified as a requirement and that the cost for their inclusion be confirmed in cost line items such as interior specialties, finishes, plumbing, equipment, etc. [The detailed cost estimate does include lockers under interior specialties, and ADA shower units under 'plumbing fixtures.' Confirm that showers provided are capable of serving 5% or more of the building occupants].
1.C4.4 Schneider	Special provisions for car pool or van pool parking are not called out in the 1391. While these should not affect the project scope/cost, mention will support project sustainability goals. However, special signage for handicapped parking warrants a line item cost, car pool or van pool parking signage costs should be included as well. No 'car pool or van pool' costs are found in the detailed cost estimate.
1.C4.4 Schneider	Points are being claimed for alternative transportation for reduction in parking lot sizes. This scope reduction should help to offset cost increases for permeable surfaces, etc. Confirm scope and cost estimate implications.
Schneider	Pedestrian and bicycle paths are important site features, that may or may not exist in and around Aberdeen Proving Ground or the selected site, nor may they be included in Aberdeen master plans. Regardless, this project should either do what it can to promote such paths and or accommodate them if and when they are developed.
Loechl/Tooker	Possibly include a map documenting the "ease" of using the transit system and/or bikes.
Pellegrin/LEED™	Credit 4.1 – Alternative Transportation – Public Transportation Provide proper documentation and it should be an easy point. Local knowledge of the bus and rail systems is necessary for this credit. The planning charrette states that Site 4 may be within ¼ mile of the train station. Also, if there is a bus system on base, this may also qualify for the credit. In some cases the USGBC will accept slight variations of distance.
Pellegrin/LEED™	Credit 4.2 - Alternative Transportation — Bike Storage and Shower Facilities This should be an easy credit. Implement space for showers and bike space in design that accommodates at least 23 bikes stored (5% of 450 building occupants) and 3 showers.
Pellegrin/LEED™	Credit 4.3 - Alternative Transportation - In a campus environment where the majority of the vehicles travel only short distances on a daily basis, electric cars are very practical. Fueling stations cost approximately \$15,000 each, which have not yet been indicated in the budget. Assuming 270 parking spaces, 9 fueling facilities will be needed to attain this credit at an estimated cost of \$135,000. Reducing the total parking capacity will reduce this cost since fewer fueling facilities will be required.

Pellegrin/LEED™	Credit 4.4 – Alternative Transportation – Parking Capacity
	Note that 14 parking spaces will need to be reserved for car and vanpools, assuming 270 parking spaces. This should be an attainable point.
Johnson/Stumpf	1.C4.2 Be sure to indicate bike racks and changing facilities/showers in the building plan. CERL does not currently see information indicating that showers will be included in the building (1391 estimate does not make that clear).
Johnson/Stumpf	1.C4.4 Please include data indicating minimum installation/base parking requirements. Currently, the parking capacity of 270 seems appropriate. Good!

1.C5 Reduced Site Disturbance (1)

Intent:	Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.
Requirement:	☐ On greenfield sites, limit site disturbance including earthwork and clearing of vegetation to 40 ft beyond the building perimeter, 5 ft beyond primary roadway curbs, walkways, and main utility branch trenches, and 25 ft beyond pervious paving areas that require additional staging areas to limit compaction in the paved area; OR, on previously developed sites, restore a minimum of 50% of the remaining open area by planting native or adapted vegetation. ☐ Reduce the development footprint (including building, access roads and parking) to exceed the installation/base's/master plan local zoning's open space requirement for the site by 25% or in accordance with installation/base policy on open space set asides, whichever is greater.
Technologies /Strategies:	Note requirements on plans and in specifications. Establish contractual penalties for destruction of trees and site areas noted for protection. Reduce footprints by tightening program needs and stacking floor plans. Establish clearly marked construction and disturbance boundaries. Delineate lay-down, recycling, and disposal areas. Use areas to be paved as staging areas. Work with local horticultural extension services, native plant societies, or installation/base agronomy staff to select indigenous plant species for site restoration and landscaping.

Comments

1.C5.1 Schneider	The only points being claimed for reduced site disturbance pertain to 'reduced development footprint.' While there are cost trade-offs between low and mid-rise construction, this has few if any implications for the 1391. There is no reason why an additional point cannot be claimed for 'limit site disturbance.' This is simply a 'construction management' issue. Site disturbance is limited to specified zones around new construction. Lastly, in that this is a 'showcase' project, all attempts should be made to restore 50% of the previously developed open space on the site. This may not add cost and may be an opportunity for placement of the trees being relocated.
Pellegrin/LEED™	Credit 5.1 – Reduced Site Disturbance – Protect and Restore Open Space This credit should be fairly easy to attain. Be sure to limit the size of the construction site, especially on the north side to avoid disturbing the forest. From the point of view of this credit, it may be a more efficient use of land and require the removal of fewer trees if parking is relocated to the unforested northwest corner. Also, the areas of the concrete slab currently designated to support the PV arrays might be used for parking and the PV arrays transferred to the roof where they would be less shadowed.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Pellegrin/LEED™	Credit 5.2 – Reduced Site Disturbance – Development Footprint
	This should be an easy credit – just protect the forest to the north and leave this land undeveloped.
Johnson/Stumpf	1.C5.1 Why is this credit being disregarded? Is there a reason that 50% of the remaining open area cannot be restored?
	1.C5.2 OK ... but the development footprint could be further reduced.
1.C5.2 Loechl/Tooker	If concrete pad is present, is building footprint really reduced?
	The 1391 should not constrain the designer as to footprint of parking lot or other site features. Current depiction of parking is very close to a drainage swale and includes the removal of 2.5 acres of trees. This increases site disturbance and costs. Consider describing the opportunity of reusing existing open space, and/or replanting 50% of remaining open space.

1.C6 Stormwater Management (1)

Intent: Limit disruption of natural water flows by minimizing storm water runoff, increasing on-site infiltration and reducing contaminants.

Requirement: Implement a stormwater management plan that results in:

- ☐ No net increase in the rate or quantity of stormwater runoff from undeveloped to developed conditions; OR, if existing imperviousness is greater than 50%, implement a stormwater management plan that results in a 25% decrease in the rate and quantity of stormwater runoff.
- ☐ Treatment systems designed to remove 80% of the average annual post development total suspended solids (TSS), and 40% of the average annual post development total phosphorous (TP), by implementing Best Management Practices (BMPs) outlined in EPA's Guidance Specifying Management Measures for Sources of Non-point Pollution in Coastal Waters (EPA-840-B-92-002 1/93).

Technologies /Strategies: Significantly reduce impervious surfaces, maximize on-site stormwater infiltration, and retain pervious and vegetated areas. Capture rainwater from impervious areas of the building for groundwater recharge or reuse within building. Use green/vegetated roofs. Utilize biologically-based and innovative stormwater management features for pollutant load reduction such as constructed wetlands, stormwater filtering systems, bioswales, bio-retention basins, and vegetated filter strips. Use open vegetated swales to reduce drainage velocity and erosion, reduce system maintenance, increase vegetative variety and support wildlife habitat where space permits.

Comments

1.C6.1 and 1.C6.2
Scholze The only points being claimed for reduced stormwater management pertain to decreasing the rate and quantity of stormwater run-off. The 1391 appears adequate in this regard. There is no reason why an additional point cannot be achieved, however, in the area of non-point pollution control. Appropriate design of site features, paving, and retentions systems should make this goal achievable with no extra cost. Retention systems are already included.

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Loechl/Tooker Need to clarify where detention pond overflow water goes. The western pond should flow to Hoadley road and the eastern pond to Wise road, not both to Wise.

Site and building runoff should not be piped unless grading prevents it. Building downspouts should utilize water capture in cisterns and water infiltration in rain gardens. Water flow from rain gardens, hard surfaces and the general site should gradually flow overland to the detention basins. The 1391 needs to better describe the goal of capturing and infiltrating storm water to minimize runoff from the site and to maximize pollution removal.

1.C6.2
Scholze It should be possible to claim an additional point for the phosphorous and sediment control with appropriate practices. Maryland is one of the most progressive states in the country in this regard and substantial opportunities exist for this type of control. The state requirement is the 10% rule for IDAs, however, options which can achieve 40 percent or better phosphorous removal include a number of types of wetlands and ponds, infiltration basins and trenches, sand filters and swales. Detention facilities, dry ponds, biofilters, filterstrips, and open channels are among the options which should not be used as they cannot achieve the required removals.

1.C6.1
and
1.C6.2
Scholze Recommend constructed wetland for stormwater management rather than retention ponds, although ponds could be modified and incorporated as part of stormwater management system. Also use infiltration basins and trenches.

Johnson/
Stumpf 1.C6.2 Why not implement some type of filtration system? Additionally, a bioswale could perform this filtration in a natural fashion.

Pelle-
grin/LEED™ Credit 6.1 – Storm water Management – Rate or Quantity

Because the storm water is being collected in cisterns for use as potable water, this credit should not be a problem. The reuse of the concrete slab should mean that there will be relatively little difference between pre- and post-construction run-off.

Pelle-
grin/LEED™ Credit 6.2 – Storm water Management – Treatment

Again, since the storm water is being collected in cisterns and reused as potable water, this should be an easy credit.

1.C7 Landscape and Exterior Design to Reduce Heat Islands (2)

Intent: Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

- Requirement: ☐ Provide shade (within 5 years) on at least 30% of non-roof impervious surface on the site, including parking lots, walkways, plazas, etc., OR, use light-colored/ high-albedo materials (reflectance of at least 0.3) for 30% of the site's non-roof impervious surfaces, OR place a minimum of 50% of parking space under-ground OR use open-grid pavement system (net impervious area of LESS than 50%) for a minimum of 50% of the parking lot area.
- ☐ Use ENERGY STAR Roof compliant, high-reflectance AND low emissivity roofing (initial reflectance of at least 0.65 and three-year-aged reflectance of at least 0.5 when tested in accordance with ASTM E408) for a minimum of 75% of the roof surface; OR, install a "green" (vegetated) roof for at least 50% of the roof area.

Technologies /Strategies: Employ design strategies, materials, and landscaping designs that reduce heat absorption of exterior materials. Note albedo/reflectance requirements in the drawings and specifications. Provide shade (calculated on June 21, noon solar time) using native or climate tolerant trees and large shrubs, vegetated trellises, or other exterior structures supporting vegetation. Substitute vegetated surfaces for hard surfaces. Explore elimination of blacktop and the use of new coatings and integral colorants for asphalt to achieve light colored surfaces.

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Comments

- 1.C7.1
Schneider It appears from the 1391 that strategies for heat island reduction are included, e.g., shading by the removal and replacement of mature trees and permeable pavement systems. There does not appear to be any line item costs for new plant materials/trees. Landscaping requirements may require a combination of new and existing plant materials. [The detailed cost estimate includes line items for 'landscaping' and 'reforestation' for \$30,246 and \$141,552 respectfully].
- 1.C7.1
Schneider Additional islands are necessary to place trees throughout a parking lot to achieve target heat island reduction results. These may or may not add cost depending on the final configuration and trade-offs (More islands but smaller parking lot with-out curb and gutter, etc). Cost features for a 'green' parking lot need to be taken into consideration in the cost estimate.
- 1.C7.1
Schneider The 'solar arrays' envisioned as a stand-alone facility might be configured as both shading and shelter for vehicular parking. As 'shading devices' they reduce heat islands. With the incorporation of solar collectors and electric vehicle recharging stations, they become solar farms meeting alternative energy and transportation goals. This strategy would also have the advantage of reducing the development footprint, allow more area for restoration, etc. allowing for multiple points from the same project elements/effort/cost.
- 1.C7.2
Schneider Other heat island strategies should be able to be accomplished at no additional cost, e.g., high albedo roofs.
- There should be no special 1391 requirements for an Energy Star roof.
- 1.C7.1
and
1.C7.2
Loechl/Tooker The "showcase" parking lot could accommodate turf and gravel in a porous paving system, such as GeoWeb with GeoBlock underneath. Turf reduces parking lot heat, automobile temps and thus volatile vapor loss. Turf areas could be in the overflow or less used areas.
- High albedo roofs, such as green roofs, cost about \$15-20 per square foot (compared to about \$8-\$15/sq. ft. in Europe).
- Retaining the existing concrete pad will contribute to heat island effect and look unaesthetic.
- 1.C7.2
Scholze For capture of rainwater from roof, it is recommended to use a metal roof.
- Pellegrin/LEED™ Credit 7.1 – Landscaping and Exterior Design to Reduce Heat Islands – Non-roof
- Shading the building is practical and economically sound with intelligent use of landscaping. However, the parking lot as designed may prevent you from getting this credit since at least 30% of the parking lot must also be shaded. This could be done fairly practically with trees or a parking area roofed with PV tiles. Alternatively, the use of a permeable paver or gravel for at least 50% of the parking area should satisfy this requirement.
- Pellegrin/LEED™ Credit 7.2 – Landscaping and Exterior Design to Reduce Heat Islands – Roof
- The planned use of Energy-Star roofing should receive this credit. Sarnafil Roofing Systems is a good company and resource for further information on this type of roofing material. The website for Sarnafil is <http://www.sarna.com>.

1.C8 Light Pollution Reduction (1)

- Intent: Eliminate light trespass from the building site, improve night sky access, and reduce development impact on nocturnal environments.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Requirement: ☐ Do not exceed Illuminating Engineering Society of North America (IESNA) footcandle level requirements as stated in the Recommended Practice Manual: Lighting for Exterior Environments, AND design interior and exterior lighting such that zero direct-beam illumination leaves the building site.

Technologies /Strategies: Consult IESNA Recommended Practice Manual: Lighting for Exterior Environments for Commission Internationale de l'Eclairage (CIE) zone and pre and post curfew hour descriptions and associated ambient lighting level requirements. Ambient lighting for pre-curfew hours for CIE zones range between 0.01 footcandles for areas with dark landscapes such as parks, rural, and residential areas, and 1.5 footcandles for areas with high ambient brightness such as installation/base areas with high levels of nighttime activity. Design site lighting and select lighting styles and technologies to have a minimal impact off-site and minimal contribution to sky glow. Minimize lighting of architectural and landscape features. Exterior lighting should be consistent with security lighting requirements.

Comments

1.C8.1
Schneider Special consideration must be given to fixture selection and placement to achieve requirements for light pollution reduction while considering parking lot tree shading patterns for heat island reduction. While fixtures are readily available, the described '40 foot high 400-watt Metal Halide Parking lot lighting standards and 100-watt Metal Halide bollards' may render the light pollution goals infeasible. Shorter standards are normally required to keep light from leaving the site, and to be able to light parking surfaces under and around mature trees. The estimate may need to be increased in this area.

Pellegrin/LEED™ This credit should be attainable. Just make sure your maximum brightness levels match the standard.

1.C9 Optimize Site Features

Intent: Optimize utilization of the site's existing natural features and placement of man-made features on the site.

Requirement: ☐ Perform both of the following:

- Maximize the use of free site energy.
- Plan facility, parking and roadways to "fit" existing site contours and limit cut and fill.

Technologies /Strategies: Evaluate site resources to ascertain how each can enhance the proposed project and visa versa. Work to maximum advantage of the site's solar and wind attributes. Use landscaping to optimize solar and wind conditions and to contribute to energy efficiency; Locate and orient the facility on the site to optimize solar and wind conditions.

Comments

1.C9.1
Schneider While the 1391 'Description of Proposed Construction' identifies that minimal grading will be done in the parking lot, this is not enough to garner the point for 'optimize site features.' The basic intent is to take advantage to the maximum extent possible the natural features of the site for energy reduction, aesthetics, minimal environmental impact, etc. The site sketch currently has the facility conforming to the footprint of the existing building instead of optimally orienting the building for solar, winds, shading, etc. Reuse of the existing slab will not (nor is it being considered to) garner points for 'building reuse.' For sustainability goals, it would be desirable to optimally orient the new facility in the given open space, remove and reuse the existing materials from the slab, and restore the damaged areas of the site. While not specifically applicable here, siting and building configuration should take into account optimal strategies for daylighting (see below). The currently sketch plan is not optimized for daylight penetration of the first floor spaces.

Loechl/Tooker The parking lot should focus on using existing open space rather than forested areas. Orientation of the building to accommodate this kind of parking also affords benefits for solar, wind, and shading. The 1391 should discuss the program for optimizing the site features.

Johnson/Stumpf 1.C9.1 How was "free site energy" utilized? CERL sees little indication of investigation into solar angles, wind energy, and geothermal power.

1.C10 Facility Impact

- Intent: Minimize negative impacts on the site and on neighboring properties and structures; avoid or mitigate excessive noise, shading on green spaces, additional traffic, obscuring significant views, etc.
- Requirement: ☐ Cluster facilities to reduce impact, access distance to utilities and sufficient occupant density to support mass transit.
- ☐ Collaborate with installation/base and community planners to identify and mitigate potential impacts of the project beyond site boundaries, and transportation planners to ensure efficient public transport.
- Technologies /Strategies: Involve local/regional planners and community members in installation/base master planning processes. Recognize the context and the impact of a project beyond site boundaries, and integrate it with the larger installation/base/community context/land use.

Comments

- 1.C10.1 Johnson/Stumpf 1.C10.1 How are facilities being "clustered" in this scheme? The building is sited independently of other buildings and is bounded by a road, train tracks, and some small forests. CERL does not interpret this as "clustering."

1.C11 Site Ecology

- Intent: Identify and mitigate all existing site problems including contamination of soil, water, and air, as well as any negative impacts caused by noise, eyesores, or lack of vegetation, enhancing or creating new site habitat.
- Requirement: ☐ Develop site environmental management and mitigation plan.
- Technologies /Strategies: Understand site and surrounding ecosystem interdependence and interconnectivity. Plan landscaping scheme to incorporate biodiversity. Preserve/enhance existing trees, hydrological features, ecosystems, habitats, and cultural resources. Increase the existence of healthy habitat for native species. Reintroduce native plants and trees where they have been destroyed by previous development.

Comments

- Schneider (See also Reduced Site Disturbance and Optimize Site Features above) Planting trees 1:1 is not sufficient to garner points for Site Ecology. The intent is to identify and mitigate to the maximum extent possible existing problems on the site. Minimizing the facility footprint, siting the building and parking in existing open spaces, and removal of the old warehouse slab would allow maximum protection of existing natural assets and allow restoration of major areas of the site.
- Loechl/Tooker Removal of 2.5 acres of mature woods does not help site ecology.
- Johnson/Stumpf 1.C11.1 OK - be sure to include Environmental Management and Mitigation Plan for credit.

2.0 Water Efficiency**2.C1 Water Efficient Landscaping (2)**

- Intent: Limit or eliminate the use of potable water for landscape irrigation.
- Requirement: ☐ Use high efficiency irrigation technology, OR, use captured rain or recycled site water to reduce potable water consumption for irrigation by 50% over conventional means.

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- ☐ Use only captured rain or recycled site water for an additional 50% reduction (100% total reduction) of potable water for site irrigation needs, OR, do not install permanent landscape irrigation systems.

Technologies /Strategies: Develop a landscaping water use baseline according to the methodology outlined in the LEED™ Reference Guide. Specify water-efficient, native or adapted, climate tolerant plantings. High efficiency irrigation technologies include micro irrigation, moisture sensors, or weather data based controllers. Feed irrigation systems with captured rainwater, gray water, or on-site treated wastewater.

Comments

2.C1.1 and 2.C1.2 Loechl/Tooker Need to explain the goal of the cistern water and the detention ponds as sources for irrigation. The 1391 needs to say that no permanent irrigation system will be installed, or that a combination of xeriscape principles and captured rainwater will meet all needs for irrigation without using potable water to gain the 2 LEED™ points.

2.C1.1 and 2.C1.2 Scholze Not clear whether there is any intent to put in an irrigation system. This area gets adequate rainfall in normal conditions. If there is, see above. First point should be able to get easily by using high efficiency irrigation technology. Leftover graywater or captured roof runoff could be used for irrigation. Another option might be to use captured pondwater in the constructed wetland deep pool as an irrigation source.

Pellegrin/LEED™ Credit 1 – Water Efficient Landscaping

This is definitely plausible. Assuming that potable water is not trucked into the site for irrigation purposes, all of the irrigation will be coming from rainwater. If necessary, consider supplementing the storm water with water from the water table. Since this water is perceived as polluted at the site, you may be allowed to supplement the irrigation with groundwater. Also, the use of native and drought-resistant plants will be helpful in attaining this credit.

2.C2 Innovative Wastewater Technologies (2)

Intent: Reduce generation of wastewater and potable water demand, while increasing local aquifer recharge.

Requirement: ☐ Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 50%, OR, treat 100% of wastewater on site to tertiary standards.

Technologies /Strategies: Develop a wastewater baseline according to the methodology outlined in the LEED™ Reference Guide. Implement decentralized on-site wastewater treatment and reuse systems. Decrease the use of potable water for sewage conveyance by utilizing gray and/or black water systems. Non-potable reuse opportunities include, toilet flushing, landscape irrigation, etc. Provide advanced wastewater treatment after use by employing innovative, ecological, on-site technologies including constructed wetlands, a mechanical recirculating sand filter, or aerobic treatment systems.

Comments

2.C2.1 Scholze Following a baseline analysis as for 2.C3, potable water demand is reduced by the use of the alternative toilets and urinals and appurtenances. A 50 percent reduction in sewage can be achieved. Also, the building should be plumbed for graywater reuse from lavatories and shower facilities that could be reused for toilet flushing. A rainwater roof catchment system could also be tied in for that purpose. This point is achievable.

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Pellegrin/LEED™	Credit 2 – Innovative Waste Water Technologies - It is not a sure thing, but it may be possible to get this credit. As written in the LEED™ Reference Guide, the emphasis for this credit is not on the innovativeness (i.e., originality) of the solution, but on the diversion of water from local treatment facilities. As such, by using a permeable paver for the parking lot and installing a septic system with the septic field under the parking lot, this credit may be attainable. Overflow, when necessary, could be shunted to the municipal systems since this credit only requires 50% diversion from the wastewater treatment facilities. The applicability of this system will depend partially on how high the water table is, since groundwater tables that are extremely close to the surface prevent septic systems from being effective. Consult a civil engineer for more details.
Johnson/Stumpf	2.C2.1 Why not reduce the use of potable water for sewage conveyance or treat waste on-site with a living machine? The living machine option would be a great demonstration tool, and could be incorporated into the bioswale CERL suggests.

2.C3 **Water Use Reduction (1)**

Intent:	Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.
Requirement:	☐ Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting Energy Policy Act (EPACT) of 1992 fixture performance requirements. ☐ Exceed the potable water use reduction by an additional 10% (30% total efficiency increase).
Technologies /Strategies:	Develop a water use baseline including all water consuming fixtures, equipment, and seasonal conditions according to methodology guidance outlined in the LEED™ Reference Guide. Specify water conserving plumbing fixtures that exceed Energy Policy Act (EPACT) of 1992 fixture requirements in combination with ultra high efficiency or dry fixture and control technologies. Specify high water efficiency equipment (dishwashers, laundry, cooling towers, etc.). Use alternatives to potable water for sewage transport water. Use recycled or storm water for HVAC/process make up water. Install cooling tower systems designed to minimize water consumption from drift, evaporation and blow-down.

Comments

2.C3.1 Scholze	A baseline and design analysis of the project was conducted using the LEED™ spreadsheet. It is easily achievable to get both points for this section (over 50 percent reduction) by using ultralowflow toilets for both men and women and waterless urinals for men. Waterless urinals have met great success at many facilities. Faucet aerators should be used in lavatories and lowflow showerheads in shower facilities. It will not be necessary to have automatic shutoffs for sinks as that is an expensive added expense. Sinks for janitors and the kitchen can be standard. 1391 mentions automatic flush valves and faucets. With waterless urinals, not necessary. For faucets, look at cost, may be an extra \$150 each, poor payback. At \$7.43 per 1000 gallons for water and sewage and going higher, water efficiency should be a point of emphasis and help offset the cost of dual plumbing systems. Therefore, the building should be plumbed for dual (graywater) systems so it has the capability to use graywater for toilet flushing purposes in combination with roof runoff.
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(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Pelle-
grin/LEED™

Credit 3 – Water Use Reduction –

This credit is possible. Infrared sensors for faucets help reduce water use. While in theory, infrared sensors on toilets are also supposed to help reduce water use, these require a lot of fine-tuning and adjustment to ensure flushing only occurs when needed. Low-flow toilets should definitely be used to reduce water use.

In the Planning Charrette Report, waterless urinals were pulled out of consideration because of the misperception that waterless urinal maintenance is more difficult and waterless urinals less aesthetically pleasing. Currently waterless urinals are being used at universities, elementary schools, national parks, post offices, and military installations, as listed in Annex A2. After experiencing the minimal maintenance necessary for waterless urinals, many of these places have ordered more units and are changing out their conventional urinals for waterless ones. In our experience, waterless urinals have been problem-free and have drastically reduced our water usage. In addition, they are also one of the highlights of visitor tours, which may be an important consideration for a show-case building. Waterless urinals usually guarantee a point in the Water Efficiency category. By using waterless urinals in combination with the other technologies proposed, both points for water use reduction should be attainable.

Johnson/
Stumpf

2.C3.2 Can water use not be further reduced? Strongly consider using waterless urinals and low flow toilets and fixtures. <http://www.bricor.com/> <http://www.falconwaterfree.com/> CERL has waterfree urinals and can answer any questions you have.

3.0 Energy and Atmosphere

3.R1 Fundamental Building Systems Commissioning (1)

Intent: Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.

Requirement: ☐ Implement all of the following fundamental best practice commissioning procedures.

- Engage a commissioning authority.
- Develop design intent and basis of design documentation.
- Include commissioning requirements in the construction documents.
- Develop and utilize a commissioning plan.
- Verify installation, functional performance, training and documentation.
- Complete a commissioning report.

Technologies /Strategies: Introduce standards and strategies into the design process early, and then carry through selected measures by clearly stating target requirements in the construction documents. Tie contractor final payments to documented system performance. Perform additional commissioning in accordance with the DOE Building Commissioning Guide, Version 2.2. Refer to the LEED™ Reference Guide for detailed descriptions of required elements and references to additional commissioning guides. Specify pre-occupancy baseline IAQ testing at time of commissioning. Test for indoor air concentrations of CO, CO2, total VOCs and particulates. Test to assure that adequate ventilation rates have been achieved prior to initial occupancy.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Comments

3.R1.1
Schwenk Use of UFGS-15995 (Commissioning of HVAC Systems) should ensure that credits are awarded. Consider adding statement to DD-1391 that UFGS-15995 will be used. 15995 will require editing to be made project specific. 15995 does not contain a heat pump system or a thermostat (without a VAV box), and the VAV scheme proposed in the 1391 is unusual compared to that contained in 15995. The designer may want to consider the potential difficulty in commissioning a heat pump-based pressure-independent VAV system with manually adjustable diffusers supplying 68 °F air and using ceiling-based radiant heat panels. This system sounds creative but unusual.

3.R2 Minimum Energy Performance (1)

Intent: Establish the minimum level of energy efficiency for the base building and systems.

Requirement: ☐ Design to meet building energy efficiency and performance as required by TI 800-01 (Design Criteria).

Technologies /Strategies: Use building modeling and analysis techniques to establish and document compliance. ASHRAE/IESNA Standard 90.1-1999 provides guidance for establishing building base case development and analysis. Refer to the LEED™ Reference Guide for a wide variety of energy efficiency strategy resources.

Use a professionally recognized and proven computer program or programs that integrate architectural features with air-conditioning, heating, lighting, and other energy producing or consuming systems. These programs will be capable of simulating the features, systems, and thermal loads used in the design. Using established weather data files, the program will perform 8760 hourly calculations. BLAST, DOE-2 or EnergyPlus are acceptable programs for these purposes.

Comments

3.R2.1
Johnson/
Stumpf 3.R2.1 OK - be sure to invest time and money in developing the "base case" and performing energy analyses.

3.R3 CFC Reduction in HVAC&R Equipment (2)

Intent: Reduce ozone depletion.

Requirement: ☐ Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phaseout conversion.

Technologies /Strategies: Specify only non-CFC-based refrigerants in all base building HVAC&R systems.

Comments

3.R3.1 None

3.C1 Optimize Energy Performance (1)

Intent: Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.

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- Requirement: ☐ Reduce design energy usage (DEU) compared to the energy use budget (EUB) in joules per square meter per year for regulated energy components as described in the requirements of Chapter 11 of the TI 800-01 (Design Criteria), as demonstrated by a whole building simulation.
- 1 Point will be awarded for every reduction in design energy use of 2.5% for both new and existing facilities for a maximum score of 20 points.
 - Regulated energy components include HVAC systems, building envelope, service hot water systems, lighting and other regulated systems as defined by ASHRAE.

Technologies /Strategies: Develop and use building modeling and analysis techniques to establish a base case that meets the minimum prerequisite standard. ASHRAE/IESNA Standard 90.1-1999 provides guidance for establishing building base case development and analysis. Perform interactive energy use analysis for selected design elements that affect energy performance and document compliance.

Unit of measure for performance shall be annual energy usage in joules per square meter. Life-Cycle energy costs shall be determined using rates for purchased energy, such as electricity, gas, oil, propane, steam, and chilled water and approved by the adopting authority. Refer to the LEED™ Reference Guide or Whole Building Design Guide for a wide variety of energy efficiency resources and strategies including conservation measures, electromechanical energy efficiency technologies (for example ground-source heat pumps), passive heating and cooling strategies, solar hot water, and daylighting.

Life-Cycle costing will be done in accordance with 10 CFR 436.

Consider installation of an Energy Management and Control System (EMCS), which is compatible with existing installation systems to optimize performance. Use sensors to control loads based on occupancy, schedule and/or the availability of natural resources use (day light or natural ventilation).

Comments

3.C1.1 Schwenk Use of UFGS-13801 'Utility Monitoring and Control Systems' (UMCS) would contribute to point scoring, and is highly recommended. Recommend dual bid approach:

- Specify interface to existing base-wide UMCS, if there is one, and
- Specify LonWorks-based or BACnet-based system. The key requirement is an 'open' system. The Corps is in the process of updating UFGS-13801 to specify LonWorks technology.
- A LonWorks or BACnet-based UMCS can optimize system performance in several respects:
- Cost effective, energy efficient, and environmentally-friendly control hardware can be selected from multiple vendors,
- The system can be designed to provide occupant access to the environmental control system via web-browser for viewing of environmental sensor readings and, should it be so desired, environmental control system setpoint adjustment.
- IAQ sensor readings can be monitored and stored for later retrieval/review.
- (CO2, CO, humidity, temperature, VOCs, etc.)
- Dry-bulb economizer (for MAU and possibly for heat pump)
- Interface to fire and security systems (is feasible with LonWorks)
- Measurement and Verification using detailed HVAC controls and UMCS specification.
- Scheduled start/stop to accommodate building/office occupancy
- Thermostats with unoccupied mode override, to provide for after-hours start up of heat pumps. Used in conjunction with scheduled start/stop)
- Items 4, 7, and 8 can be incorporated as part of a local/ordinary control system (not part of a more sophisticated and expensive 'UMCS' with data collecting capability and a user/operator interface).
- Only 12 of the possible 20 SPiRiT points are claimed in the 'Facility Points Summary'. The rationale for distribution/breakdown for the 12 points is not known, but a UMCS should help contribute to the point total.

Pellegrin/LEED™	Credit 1 – Optimizing Energy Performance – These credits are some of the most important credits to achieve to get a Platinum rating. Note that the initial 20% higher efficiency is worth 2 points, and each additional 10% of efficiency is worth another 2 points. Because such high point values are awarded, it is an excellent place to make up ground potentially lost in other areas. Initially the energy upgrades to the mechanical systems may be more expensive, but the payoff over the lifecycle of the building more than makes up for the additional cost. In addition, no great innovation or inconvenience is needed to achieve high energy efficiency – just some clever engineering. It is important to notice that passive systems, such as dual-paned windows, appropriate R-valued insulation, and the skin of the building, can make a dramatic difference in energy usage for heating and cooling. High-efficiency fluorescent lamps and maximization of natural day lighting are also necessities. The D.O.E. 2 model, found at http://www.doe2.com/, is a comprehensive model of energy usage throughout the building and can be used during the design phase to predict the building's energy usage.
Johnson/Stumpf	3.C1.1 AEC will need to contract considerable in-depth investigation, review, and testing to justify 12 SPiRiT credits.
3.C2	<u>Renewable Energy (1)</u>
Intent:	Encourage and recognize increasing levels of self-supply through renewable technologies to reduce environmental impacts associated with fossil fuel energy use.
Requirement:	☐ Supply a net fraction of the building's total energy use through the use of on-site renewable energy systems. <u>% of Total Annual Energy Usage in Renewables</u> 5% 10% 15% 20%
Technologies /Strategies:	Employ the use of on-site non-polluting-source renewable technologies contributing to the total energy requirements of the project. Consider and use high temperature solar and/or geothermal, photovoltaics, wind, biomass (other than unsustainably harvested wood), and bio-gas. Passive solar, solar hot water heating, ground-source heat pumps, and daylighting do not qualify for points under this credit. Credit for these strategies is given in Energy & Atmosphere Credit 1: Optimizing Energy Performance.
Comments	
3.C2.1 Johnson/Stumpf	3.C2.1 Why was there not further investigation of renewable energy sources like biomass, biogas, wind, geothermal, etc?

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Pelle-
grin/LEED™

Credit 2 – Renewable energy-

Whoever supplies energy to the Aberdeen Proving Grounds should supply a Power Content Label (PCL). The PCL shows the breakdown of energy sources, i.e., what percentage of the energy comes from large and small hydroelectric, nuclear, waste gas, or wind. If there is enough produced from waste gas, small hydroelectric, solar, or wind to make up 5% or more, a point will be awarded. The renewable energy in the PCL combined with on-site solar could potentially be as high as 20% of the total energy. However, renewable energy is one of the hardest points to attain due to high costs in production. It may be worth using solar water heating since the system is relatively simple to install and would lower the use of gas and electricity.

Ducey

Basically, I agree with the decision not to pursue any SPiRiT points for Renewables. To get even one point, they would have to supply 5% of the building's energy from renewable energy technologies. Concepts like ground source heat pumps and passive solar elements are considered in categories other than renewables, leaving active solar and wind.

Even if they were in a good wind resource area, putting up a wind turbine large enough to supply 5% of the needed energy is probably infeasible. However, after reading through the internet articles regarding "urban" wind electrical generation, which the Dutch are trying in their cities (<http://stacks.msnbc.com/news/863721.asp?cp1=1#BODY> and <http://www.capecodonline.com/special/windfarm/urbturb27.htm> and the related <http://www.gristmagazine.com/powers/powers121902.asp?source=daily>), I was able to determine that the roof mounted Dutch wind turbines must be rated at around 1- to 2-kW and that their cost for electricity must be 18 cents/kWh. The cost for the turbines is somewhere around \$5000/kW, installed, which sounds about right for machines that size. The article said that there was sufficient wind in Holland to operate the turbines an equivalent of 245 days per year (about two thirds of the time) at rated capacity. That's what is known as a 67% capacity factor. I'm not saying that it's an exaggeration of the wind potential in Holland, but wind developers in the United States really start to get excited when they find an area where the capacity factor approaches 40%. I would guess that the AEC building site would be lucky to be somewhere near 25%.

I recently got our ERDC/CERL monthly charges for the last 12 months and we averaged about 250,000-kWh/month, or about 8,500-kWh/day, at a cost of about 7.5-cents/kWh. If I remember right, the AEC load was larger than ours, so you can use whatever reasonable multiplier on this analysis, which uses our numbers. Let's say that 8,500-kWh/day is a good number to work with. If we wanted to supply 5% of the building load with wind (to collect one SPiRiT point), that would be 425-kWh/day, or about 18-kWh every hour, or 18-kW being generated every hour of the day. But we know that wind turbines don't generate all the time, so let's say we are located in a good wind resource area, where we could count on a 40% capacity factor (that's being pretty optimistic). That means we would need the 18-kW required hourly generation divided by the 40% capacity factor, or about 45-kW of total wind generating capacity (so I was off by about an order of magnitude), or about 23 to 45 of the small roof mounted Dutch wind turbines, or one tower mounted 50-kW turbine, somewhere on site. After going through this analysis, I am surprised to say that this is probably technically doable.

But what about the economics? It would take an investment of about \$225K to install 45-kW of wind generating capacity. At 7.5-cents/kWh, the turbines would have to generate electricity flawlessly for over 8 years, before achieving a very optimistic simple payback. Now that I've actually cranked the numbers, it doesn't look as "out of the question" as I first thought.

There would still be the obstacles of determining what the actual capacity factor is for the AEC site, and having an environmental impact study conducted, and a decision made on whether it's acceptable to have the rooftop littered with wind turbines, and on, and on. I guess it isn't absolutely "out of the question" but, rather, more work than the designers are likely willing to put into it. But, we should probably present them with this "back of the envelope" analysis.

Regarding active solar, they are located in an area that is relatively low in solar resource too, so a photovoltaic power system would be too large and way too expensive. Solar hot water would not be cost-effective, since it is competing against natural gas-fired hot water heaters. (Hot water requirements only make up a small portion of the building energy load.)

3.C3

Additional Commissioning (2)

Intent:

Verify and ensure that the entire building is designed, constructed, and calibrated to operate as intended.

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Requirement: ☐ In addition to the Fundamental Building Commissioning prerequisite, implement the following additional commissioning tasks:

1. Conduct a focused review of the design prior to the construction documents phase.
2. Conduct a focused review of the construction documents when close to completion.
3. Conduct a selective review of contractor submittals of commissioned equipment.
4. Develop a system and energy management manual.
5. Have a contract in place for a near-warranty end or post occupancy review.

Items 1, 2, and 3 must be performed by someone other than the designer.

Technologies /Strategies: Introduce standards and strategies into the design process early, and then carry through selected measures by clearly stating target requirements in the construction documents. Tie contractor final payments to documented system performance. Refer to the LEED™ Reference Guide for detailed descriptions of required elements and references to additional guidelines.

Comments

3.C3.1 Schwenk While the SPiRiT requirements described here go hand-in-hand with the requirements of UFGS-15995 (Commissioning) they are not a specific requirement of 15995. Recommend mentioning the requirement/intent in the 1391 and in the 'Design Intent' document described in 3.R1. 'System and Energy Management Manual' requirement may be met using one or more of the UFGS-15951 and UFGS-13801 submittals. Assuming these issues are addressed, we anticipate that the SPiRiT point will be awarded.

Pelle-grin/LEED™ Credit 3- Additional Commissioning-

This should be an easy point as long as all the documentation is provided. Clearly state what the additional commissioning involves and provide letters from the third party commissioner that states all the tasks have successfully taken place. In addition to being an easy point, additional commissioning enhances a building's performance and efficiency.

3.C4 **<< Deleted >> (1)**

Pelle-grin/LEED™ Credit 4- Ozone Depletion-

This credit is to make the HVAC, fire, and refrigeration systems HCFC-free. The engineer is designing the mechanical systems must be made aware of the goal to be HCFC-free. A cut sheet and a signed letter from the engineer are required for the point. This should be another easy point to receive.

3.C4.1 Johnson/Stumpf N/A

3.C5 **Measurement and Verification (1)**

Intent: Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Requirement: ☐ Comply with the installed equipment requirements for continuous metering as stated in selected Measurement and Verification Methods - Option B: Retrofit Isolation of the US DOE's International Performance Measurement and Verification Protocol (IPMVP) for the following:

- Lighting systems and controls.
- Constant and variable motor loads.
- Variable frequency drive (VFD) operation.
- Chiller efficiency at variable loads (kW/ton).
- Cooling load.
- Air and water economizer and heat recovery cycles.
- Air distribution static pressures and ventilation air volumes.
- Boiler efficiencies.
- Building specific process energy efficiency systems and equipment.
- Indoor water risers and outdoor irrigation systems.

Technologies /Strategies: Design and specify equipment to be installed in base building systems to allow for comparison, management, and optimization of actual vs. estimated energy and water performance. Employ building automation systems to perform M&V functions where applicable. Tie contractor final payments to documented M&V system performance and include in the commissioning report. Provide for ongoing M&V system maintenance and operating plan in building operations and maintenance manuals. Consider installation/base of an Energy Management and Control System (EMCS), which is compatible with exiting installation/base systems to optimize performance.

Comments

3.C5.1
Schwenk Recommend describing how this will be met. A UMCS will likely be required to monitor and log the required data. Refer to UMCS description/comment in 3.C1. The required monitoring instrumentation can be expensive and the SPiRiT point may not be cost justified. Meeting all the listed requirements will require detailed editing of the UMCS specification including specific monitoring requirements/instrumentation and setup/definition of the trend/log data. It is not evident that M&V was accounted for in the cost estimate. The SPiRiT point is in question.

Pelle-
grin/LEED™ Credit 5- Measurement & Verification-

This credit is to ensure that the systems are running efficiently over time by installing monitors. This credit should also be attainable as long as a copy of the Measurement & Verification Plan, cut sheets of sensors and data collection systems for metering, and a schedule of the instruments and controls for the monitoring categories. Again, this depends on working with the engineer to ensure this is included with the MEP systems.

3.C6 **Green Power (1)**

Intent: Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Requirement: ☐ Engage in a 2-year contract to purchase the amount of power equal to projected building consumption generated from renewable sources that meet the Center for Resource Solutions (CRS) Green-E requirements.

Technologies /Strategies: Purchase power from a provider that guarantees a fraction of its delivered electric power is from net nonpolluting renewable technologies. Begin by contacting local utility companies. If the project is in an open market state, investigate Green Power and Power Marketers licensed to provide power in that state. Grid power that qualifies for this credit originates from solar, wind, geothermal, biomass, or low-impact hydro sources. Low-impact hydro shall comply with the Low Impact Hydropower Certification Program.

Comments

3.C6.1 Johnson/Stumpf 3.C6.1 Can "green power" not be purchased in this area?

Pellegrin/LEED™ Credit 6 – Green Power –
It is unclear how this will be achieved, so no assessment can be made.

Ducey It was not completely clear, but a Green Power purchase might not be totally out of the question. If Maryland has undergone utility deregulation, AEC would not necessarily have to purchase all of its electricity from the local utility. The Army is encouraging its facilities to purchase green power, where possible, and might even subsidize any cost differential.

3.C7 Distributed Generation

Intent: Encourage the development and use of distributed generation technologies, which are less polluting than grid-source energy.

Requirement: ☐ Reduce total energy usage and emissions by considering source energy implications and local cogeneration and direct energy conversion. Generate at least 50% of the building's projected annual consumption by on-site distributed generation sources.

Technologies /Strategies: Investigate the use of integrated generation and delivery systems, such as co-generation, fuel cells, micro-turbines and off-peak thermal storage.

Comments

3.C7.1 Holcomb/Taylor Fuel cell project is not economically feasible for the proposed building.

Johnson/Stumpf 3.C7.1 Distributed generation credit could be earned if more emphasis was placed on renewable power sources. (But it could be expensive).

4.0 Materials and Resources

4.R1 Storage & Collection of Recyclables (1)

Intent: Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Requirement: ☐ Provide an easily accessible area that serves the entire building that is dedicated to the separation, collection and storage of materials for recycling including (at a minimum) paper, glass, plastics, and metals.

Technologies /Strategies: Establish a waste management plan which meets requirements of the installation/base environmental and/or solid waste management plans in cooperation with users to encourage recycling. Reserve space for recycling functions early in the building occupancy programming process and show areas dedicated to collection of recycled materials on space utilization plans. Broader recycling support space considerations should allow for collection and storage of the required elements and newspaper, organic waste (food and soiled paper), and dry waste. When collection bins are used, bin(s) should be able to accommodate a 75% diversion rate and be easily accessible to custodial staff and recycling collection workers. Consider bin designs that allow for easy cleaning to avoid health issues.

Comments

4.R1.1 Johnson/Stumpf 4.R1.1 OK - be sure to indicate recycling area on plans.

Webster Storage & Collection of Recyclables

SPiRiT Points: Required

LEED™ Points: Required

Issue: Space and equipment for recycling functions are not programmed.

Recommendation: Reserve space for recycling functions in the building occupancy programming process and show areas dedicated to collection of recycled materials on space utilization plans. While these areas are not normally showcased, in this instance, displaying recycling statistics on information kiosks in prominent locations in the building may be desirable.

4.C1 Building Reuse (1)

Intent: Extend the life cycle 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.

Requirement: Reuse large portions of existing structures during renovation or redevelopment projects.

- ☐ Maintain at least 75% of existing building structure and shell (exterior skin and framing excluding window assemblies).
- ☐ Maintain an additional 25% (100% total) of existing building structure and shell (exterior skin and framing excluding window assemblies).
- ☐ Maintain 100% of existing building structure and shell AND 50% non-shell (walls, floor coverings, and ceiling systems).

Technologies /Strategies: Evaluate retention of existing structure. Consider facade preservation, particularly in installation/base areas. During programming and space planning, consider adjusting needs and occupant use patterns to fit within existing building structure and interior partition configurations. Identify and effectively address energy, structural, and indoor environmental (lead & asbestos) issues in building reuse planning and deconstruction documents. Percentage of reused non-shell building portions will be calculated as the total area (sq ft) of reused walls, floor covering, and ceiling systems, divided by the existing total area (sq ft) of walls, floor covering, and ceiling systems.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Comments

4.C1.1 – Why not reuse the existing building (retrofit for offices but keep the structure/skin)?
 4.C1.3
 Johnson/
 Stumpf

Pelle- Credit 1- Building Reuse-
 grin/LEED™

This credit is entirely based on calculations and pre- and post-construction plans. This credit probably is not a practical goal in this case. 75% reuse of an old building is a lot, particularly since there is likely to be a lot of lead and asbestos. The lead and asbestos will continue to be a health hazard to maintenance workers and possibly building users. If you do decide to attempt this credit, make sure you supply the plans and correct calculations showing that at least 75% of the structure has reused.

Webster Building Reuse

SPiRiT Points: 3 maximum

LEED™ Points: 3 maximum

Issue: Program does not reuse large portions of existing structures.

Recommendation: Consider retention of existing structures, even if this strategy involves innovative building additions that connect multiple buildings to meet square footage requirements.

4.C2 Construction Waste Management (1)

Intent: Divert construction, demolition, and land clearing debris from landfill disposal. Redirect recyclable material back to the manufacturing process.

Requirement: Develop and implement a waste management plan, quantifying material diversion by weight:

- ☐ Recycle and/or salvage at least 50% (by weight) of construction, demolition, and land clearing waste.
- ☐ Recycle and/or salvage an additional 25% (75% total by weight) of the construction, demolition, and land clearing debris.

Technologies /Strategies: Develop and specify a waste management plan which meets requirements of the installation/base environmental and/or solid waste management plans that identifies licensed haulers and processors of recyclables; identifies markets for salvaged materials; employs deconstruction, salvage, and recycling strategies and processes, includes waste auditing; and documents the cost for recycling, salvaging, and reusing materials. Source reduction on the job site should be an integral part of the plan.

The plan should address recycling of corrugated cardboard, metals, concrete brick, asphalt, land clearing debris (if applicable), beverage containers, clean dimensional wood, plastic, glass, gypsum board, and carpet; evaluate the cost-effectiveness of recycling rigid insulation, engineered wood products and other materials; hazardous materials storage and management; and participation in manufacturers' "take-back" programs to the maximum extent possible. Refer to the LEED™ Reference Guide for guidelines and references that provide waste management plan development and implementation support including model bid specifications.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Comments

4.C2.1 OK - be sure to show calculations and proof of the amount being recycled, and include a waste management plan with the building contract.

and
4.C2.2
Johnson/
Stumpf

Pelle-
grin/LEED™

Credit 2- Construction Waste Management Plan-

The purpose of this plan is to divert construction waste from a landfill. In Annex A1, there is a construction waste management plan that allowed Donald Bren Hall to recycle 100% of their demolition waste and 93% of the construction waste. The spec writer can alter this plan to fit the needs of the APG Building. Generally, recycling waste is cheaper for the contractors and helps keep the site cleaner during construction. Make sure the plan requires all contractors on site submit monthly waste receipts to verify recycling is being done properly. This should be two easy points, since recycling 50%-74% awards 1 point and recycling 75% or more results in 2 points.

Webster

Construction Waste Management

SPiRiT Points: 2 maximum

LEED™ Points: 2 maximum

Issue: A waste management plan is not programmed in the current DD Form 1391.

Recommendation: Develop and specify a waste management plan to divert construction, demolition, and land clearing debris from landfill disposal. Arrange for unused demolition and construction waste to be used by others, or redirect recyclable material back to the manufacturing process. To this end, contact the state and local waste management boards. As a showcase building, the design should maximize the use of products that reduce future renovation impacts (e.g., fluorescent lamp and ballast recyclers and low-mercury fluorescent lamps).

4.C3 **Resource Reuse (2)**

Intent: Extend the life cycle of targeted building materials, reducing environmental impacts related to materials manufacturing and transport.

Requirement: ☐ Specify salvaged or refurbished materials for 5% of building materials.

☐ Specify salvaged or refurbished materials for 10% of building materials.

Technologies /Strategies: Commonly salvaged building materials include wood flooring/ paneling/cabinets, doors and frames, mantels, iron work and decorative lighting fixtures, brick, masonry and heavy timbers. See the LEED™ Reference Guide for calculation tools and guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars* (see exclusions) of the salvaged or refurbished material.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

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Exclusions: In total dollar calculations, exclude; labor costs; all mechanical and electrical material and labor costs; and project overhead and fees. *If the cost of the salvaged or refurbished material is below market value, use replacement cost to estimate the material value, otherwise use actual cost to the project.

Comments

4.C3.1 and 4.C3.2 Johnson/Stumpf OK - remember to calculate the dollar value of items being recycled.

Pellegrin/LEED™ Credit 3- Resource Reuse-

This could be a credit if creative and researched well. At salvage yards, people can sometimes purchase building materials for reuse. Another way to get salvaged materials is to find a local building being remodeled or demolished. Demolition waste for reuse may also be available via websites or army surplus. It is not the easiest credit available, but an worthwhile idea if the manpower is available to pursue it.

Webster Resource Reuse

SPiRiT Points: 2 maximum

LEED™ Points: 2 maximum

Issue: It is questionable whether the partial reuse of the foundation, steel framing, and wood roof decking from Building E1890 will meet the percentage requirements for SPiRiT and LEED™ credits. This is especially true if the specified reuse materials fail testing required to ensure their structural integrity.

Recommendation: Specify salvaged or refurbished materials to the greatest extent feasible, not just those associated with Building E1890. Consider partnering with area demolition and salvage companies for access to salvage material stockpiles. Some military installations have begun to amass material salvaged from their own renovation and demolition programs. Partnering with these installations is encouraged. Commonly salvaged building materials include brick, masonry, framing lumber, heavy timbers, wood flooring, millwork, doors, plumbing and lighting fixtures, hardware, mantels, and ironwork. An innovative solution may include the reuse of old porcelain plumbing fixtures--of perhaps various colors--broken in pieces and arranged as mosaic backsplashes and wainscoting in restrooms.

4.C4 **Recycled Content (1)**

Intent: Increase demand for building products that have incorporated recycled content material, reducing the impacts resulting from extraction of new material.

- Requirement:
- ☐ Specify a minimum of 25% of building materials that contain in aggregate a minimum weighted average of 20% post-consumer recycled content material, OR, a minimum weighted average of 40% post-industrial recycled content material.
 - ☐ Specify an additional 25% (50% total) of building materials that contain in aggregate, a minimum weighted average of 20% post consumer recycled content material, OR, a minimum weighted average of 40% post-industrial recycled content material.

(1) Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

Technologies /Strategies: Specify building materials containing recycled content for a fraction of total building materials. Select products and materials with supporting information from the AIA Resource Guide or the EPA Environmentally Preferable Purchasing (EPP) Program. Common building materials and products with recycled content include; wall, partition, and ceiling materials and systems; insulation; tiles and carpets; cement, concrete, and reinforcing metals; structural and framing steel. For products/materials not listed, selection should be made on the basis of EPP criterion and/or:

- Toxicity;
- Embodied energy;
- Production use of water, energy and ozone depleting substances (ODSs);
- Production limits on toxic emissions and effluents;
- Minimal, reusable or recycled/recyclable packaging;
- Impact on indoor environmental quality (IEQ);
- Installation that limits generation of waste;
- Materials that limit waste generation over their life;
- EPA guideline compliance; and
- Harvested on a sustainable yield basis.

See the LEED™ Reference Guide for a summary of the EPA guidelines and calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of the material that contain recycled content.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees)

Comments

4.C4.1 and 4.C4.2 Johnson/Stumpf OK - be sure to communicate the need for recycled content with the GC and sub-contractors. This must be provable.

Pellegrin/LEED™

Credit 4- Recycled Content-

These credits are possible, though it is hard to get high percentages of recycled content. The overall building percentages are determined by the cost of the product. The design team should provide the percentages of post-consumer and post-industrial products used. This credit will also rely on how the specs are written. Minimum recycled contents should be specified in the specs to ensure enough recycled content will be incorporated into the building. Steel, rebar, floorings, tile, bathroom partitions, furniture and most other products made with recycled content are all available. The use of fly ash to replace some percentage of the cement in the concrete is generally cheaper and counts toward recycled content. This is a credit that is possible to get but it is hard to get high percentages. One point should be easily attained. Credit 4.2 could be a little more difficult.

Webster Recycled Content

SPIRiT Points: 2 maximum

LEED™ Points: 2 maximum

Issue: The only recycled content building product specified explicitly is the crumb rubber to be used at the service access road.

Recommendation: Maximize use of recycled products throughout the project to reduce the impacts resulting from extraction of new material. Common building materials and products with recycled content include: wall, partition, and ceiling materials and systems (e.g., structural fiberboard, laminated paperboard, and restroom toilet partitions); insulation; tiles and carpets; cement, concrete, and reinforcing metals; structural and framing steel; and latex paint. Perhaps a glazed commercial storefront product whose aluminum frame is made of recycled cans can be used for the central lobby glass curtain wall, and restrooms can be finished with tiles from recycled glass bottles. It should also be noted that many companies are improving the design of their product lines to reduce the impact of manufactured goods on the environment. One approach is modular, upgradeable, recyclable, and remanufactured components. Maximize use of such products (e.g., electronic, communication, and information systems).

4.C5 Local/Regional Materials (2)

Intent: Increase demand for building products that are manufactured locally, reducing the environmental impacts resulting from transportation, and supporting the local economy.

- Requirement: ☐ Specify a minimum of 20% of building materials that are manufactured regionally within a radius of 500 miles.
- ☐ Of these regionally manufactured materials, specify a minimum of 50% that are extracted, harvested, or recovered within 500 miles.

Technologies /Strategies: Specify and install regionally extracted, harvested, and manufactured building materials. Contact the state and local waste management boards for information about regional building materials. See the LEED™ Reference Guide for calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of material that is locally or regionally manufactured.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees.

Comments

- 4.C5.1 and 4.C5.2 Johnson/Stumpf 4.C5.1 OK - include "20% within 500-mile radius" comment in contract docs.
- 4.C5.2 OK - similar to the previous comment, include statement explaining need for regional extracting, harvesting, or recovering.

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Pellegrin/LEED™	Credit 5- Local/Regional Materials- These points seem possible. Products assembled within a 500-mile radius count as local materials, so provide documentation of mileage, product, and costs. If 50% of material can be found within a 500-mile radius, then 2 points will be awarded.
Webster	Local/Regional Materials SPiRiT Points: 2 maximum LEED™ Points: 2 maximum Issue: No mention is made in DD Form 1391 of the use of local/regional materials. Recommendation: Specify regionally extracted, harvested, and manufactured building materials to reduce the environmental impacts resulting from transportation while supporting the local economy. In the spirit of sustainability, attempt to obtain materials well within the 500-mile radius specified in SPiRiT and LEED™. Contact state and local suppliers for information about regional building materials.

4.C6 Rapidly Renewable Materials (2)

Intent: Reduce the use and depletion of finite raw and long cycle renewable materials by replacing them with rapidly renewable materials.

Requirement: ☐ Specify rapidly renewable building materials for 5% of total building materials.

Technologies /Strategies: Rapidly renewable resources are those materials that substantially replenish them-selves faster than traditional extraction demand (e.g., planted and harvested in less than a 10 year cycle) and do not result in significant biodiversity loss, increase erosion, air quality impacts, and that are sustainably managed. See the LEED™ Reference Guide for calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of materials that are considered to be rapidly renewable.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees.

Comments

4.C6.1 Johnson/
Stumpf OK - remember to calculate the dollar value of renewable materials.

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Pelle-grin/LEED™	Credit 6- Rapidly Renewable Material- This is a possible point. The rapidly renewable materials will not only provide points but will also provide the building with a long lifecycle and improved indoor air quality. To receive the point, 5% renewable materials must be used. Research individual manufacturers to find if they qualify. Building materials likely to satisfy this requirement include linoleum, bamboo flooring/cabinetry, and wheat-board instead of particleboard.
Webster	Rapidly Renewable Materials SPiRiT Points: 1 maximum LEED™ Points: 1 maximum Issue: While there is mention in the DD Form 1391 of a local reforestation effort to plant trees to replace those destroyed during construction, no rapidly renewable building products are specified to earn SPiRiT/LEED™ points. Recommendation: Reduce the use and depletion of finite raw and long cycle renewable materials by replacing them with rapidly renewable materials, including agricultural waste products. Common products include: hay bale construction; natural linoleum sheet flooring and bamboo flooring; form-release agents made from plant oils; natural paints and floor varnish made of Tung oil (pressed from the nut of the Tung tree); geotextile fabrics from coir, hemp; and jute, cork, sustainably-grown cotton, wool, and sisal.

4.C7 **Certified Wood (2)**

Intent:	Encourage environmentally responsible forest management.
Requirement:	☐ Use a minimum of 50% of wood-based materials certified in accordance with the Forest Stewardship Council guidelines for wood building components including but not limited to framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete form work and pedestrian barriers.
Technologies /Strategies:	Refer to the Forest Stewardship Council guidelines for wood building components that qualify for compliance to the requirements and incorporate into material selection for the project.

Comments

4.C.7.1 Johnson/Stumpf 4.C7.1 OK - be sure to inform the General Contractor of this decision as well.

Pelle-grin/LEED™	Credit 7- Certified Wood- This point is achievable with proper documentation. Forest Stewardship Council (FSC) certified wood is easily attainable, though it is slightly more expensive. Make sure the specs specify FSC wood for all non-reuse wood in the building.
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Webster	Certified Wood
	SPIRiT Points: 1 maximum
	LEED™ Points: 1 maximum
	Issue: Credit is claimed, but program does not specify certified wood products to earn SPIRiT/LEED™ points.
	Recommendation: Maximize the use of certified wood products where the use of wood products is planned. An exception is where the reuse of wood roof decking from Building E1890 is planned. Common wood building components include: framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete formwork, and pedestrian barriers.

5.0 Indoor Environmental Quality (IEQ)

5.R1 Minimum IAQ Performance (1)

Intent:	Establish minimum IAQ performance to prevent the development of indoor air quality problems in buildings, maintaining the health and well being of the occupants.
Requirement:	☐ Meet the minimum requirements of voluntary consensus standard ASHRAE 62-1999, Ventilation for Acceptable Indoor Air Quality and approved Addenda.
Technologies /Strategies:	Include proactive design details that will eliminate some of the common causes of indoor air quality problems in buildings. Introduce standards into the design process early. Incorporate references to targets in plans and specifications. Ensure ventilation system outdoor air capacity can meet standards in all modes of operation. Locate building outdoor air intakes (including operable windows) away from potential pollutants/contaminant sources such as sporulating plants (allergens), loading areas, building exhaust fans, cooling towers, sanitary vents, dumpsters, vehicular exhaust, and other sources. Include operational testing in the building commissioning report. Design cooling coil drain pans to ensure complete draining. Include measures to control and mitigate radon buildup in areas where it is prevalent. Limit humidity to a range that minimizes mold growth and promotes respiratory health.

Comments

5.R1.1 Schwenk	The 1391 indicates that the make-up air units were sized for 20 cfm/person. This is probably fine for an initial sizing estimate, and you may already be aware of this, but the actual ventilation must be calculated in accordance with ASHRAE Standard 62.
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5.R2 Environmental Tobacco Smoke (ETS) Control (2)

Intent:	Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).
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(1) Material adapted from USGBC LEED™ 2.0 from SPIRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

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Requirement: ☐ Zero exposure of nonsmokers to ETS by prohibition of smoking in the building, OR, by providing a designated smoking room designed to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room shall be directly exhausted to the outdoors with no recirculation of ETS-containing air to the non-smoking area of the building, enclosed with impermeable structural deck-to-deck partitions and operated at a negative pressure compared with the surrounding spaces of at least 7 Pa (0.03 inches of water gauge). Performance of smoking rooms shall be verified using tracer gas testing methods as described in ASHRAE Standard 129-1997. Acceptable exposure in non-smoking areas is defined as less than 1% of the tracer gas concentration in the smoking room detectable in the adjoining non-smoking areas. Smoking room testing as described in the ASHRAE Standard 129-1997 is required in the contract documents and critical smoking facility systems testing results must be included in the building commissioning plan and report or as a separate document.

Technologies /Strategies: Prohibit smoking in the building and/or provide designated smoking areas outside the building in locations where ETS cannot re-enter the building or ventilation system and away from high building occupant or pedestrian traffic.

Comments

5.R2.1 None

5.C1 **IAQ Monitoring (1)**

Intent: Provide capacity for indoor air quality (IAQ) monitoring to sustain long term occupant health and comfort.

Requirement: ☐ Install a permanent carbon dioxide (CO₂) monitoring system that provides feedback on space ventilation performance in a form that affords operational adjustments, AND specify initial operational set point parameters that maintain indoor carbon dioxide levels no higher than outdoor levels by more than 530 parts per million at any time.

Technologies /Strategies: Install an independent system or make CO₂ monitoring a function of the building automation system. Situate monitoring locations in areas of the building with high occupant densities and at the ends of the longest runs of the distribution ductwork. Specify that system operation manuals require calibration of all of the sensors per manufacturer recommendations but not less than one year. Include sensor and system operational testing and initial set point adjustment in the commissioning plan and report. Also consider periodic monitoring of carbon monoxide (CO), total volatile organic compounds (TVOCs), and particulates (including PM₁₀).

Comments

Pellegrin/LEED™ Credit 1- Carbon Dioxide Monitoring-

This is an easy point if the monitors are installed correctly and proper documentation - drawings, specifications, and cut sheets highlighting the installed CO₂ monitors - is provided.

Schwenk Credit is shown in the SPiRiT Points Summary, but how the monitoring is to be achieved is not mentioned in the 1391. Does the SPiRiT point justify the cost? Can we assume that CO₂ sensors will be located in each space served by a heat pump? This suggests that at least 16 CO₂ sensors will be installed. Rough estimate of 16 x \$750 installed = \$12,000. Also refer to UMCS description/comment in 3.C1. This SPiRiT point is in question.

(1)Material adapted from USGBC LEED™ 2.0 from SPiRiT 1.4, not reviewed or endorsed by U. S. Green Building Council.

5.C2 Increase Ventilation Effectiveness (2)

Intent: Provide for the effective delivery and mixing of fresh air to building occupants to support their health, safety, and comfort.

Requirement: ☐ For mechanically ventilated buildings, design ventilation systems that result in an air change effectiveness (E) greater than or equal to 0.9 as determined by ASHRAE 129-1997. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves not less than 90% of the room or zone area in the direction of air flow for at least 95% of hours of occupancy.

Technologies /Strategies: Employ architectural and HVAC design strategies to increase ventilation effectiveness and prevent short-circuiting of airflow delivery. Techniques available include use of displacement ventilation, low velocity, and laminar flow ventilation (under floor or near floor delivery) and natural ventilation. Operable windows with an architectural strategy for natural ventilation, cross ventilation, or stack effect can be appropriate options with study of inlet areas and locations. See the LEED™ Reference Guide for compliance methodology guidelines.

Comments

5.C2.1 Schneider Credit is shown in the SPiRiT Points Summary, but how it is to be achieved is not addressed in the 1391 other than a reference to ASHRAE Standard 62. We assume that it will be achieved/accomplished and the SPiRiT point will be awarded.

Pellegrin/LEED™ Credit 2- Increase Ventilation Effectiveness-
This point is possible assuming the mechanical engineer designs the building to meet the criteria. At this point in the planning stage, It is impossible be more definite.

5.C3 Construction IAQ Management Plan (2)

Intent: Prevent indoor air quality problems resulting from the construction/renovation process, to sustain long term installer and occupant health and comfort.

Requirement: Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

- ☐ During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995, AND protect stored on-site or installed absorptive materials from moisture damage, AND replace all filtration media immediately prior to occupancy (Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2-1999).
- ☐ Conduct a minimum 2-week building flushout with new filtration media at 100% outside air after construction ends and prior to occupancy, OR, conduct a baseline indoor air quality testing procedure consistent with current EPA protocol for Environmental Requirements, Baseline IAQ and Materials, for the Research Triangle Park Campus, Section 01445.

Technologies /Strategies: Specify containment control strategies including protecting the HVAC system, controlling pollutant sources, interrupting pathways for contamination, enforcing proper housekeeping and coordinating schedules to minimize disruption. Specify the construction sequencing to install absorptive materials after the prescribed dry or cure time of wet finishes to minimize adverse impacts on indoor air quality. Materials directly exposed to moisture through precipitation, plumbing leaks, or condensation from the HVAC system are susceptible to microbial contamination. Absorptive materials to protect and sequence installation include; insulation, carpeting, ceiling tiles, and gypsum products. Appoint an IEQ Manager with owner's authority to inspect IEQ problems and require mitigation as necessary.

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Comments

- 5.C3.1
Schneider Costs for the development of a Construction IAQ Management Plan and conduct of a two week 'flush-out' (if this is the anticipated strategy) need to be included in the project budget. While plan costs not strictly project 'design' related, I recommend that they be included under Tab B, "Planning and Design Data" as 'All Other Design Costs.' 'Flush-out' or air quality testing costs might similarly be listed as 'All Other Design Costs.'
- Pellegrin/LEED™ Credit 3 - Construction IAQ Management Plan (indoor and outdoor)-

This is another attainable point. Familiarizing the construction company and crews with the requirements will be necessary to attain this point. Physical measures that should be taken include covering ductwork during construction to prevent dust-trapping and allowing paints and adhesives to fully off-gas. Be sure to include in the final LEED™ submittal a copy of the management plan that meets the specified requirements. This credit also requires photos and cuts sheets.
- Schwenk Credit is shown in the SPiRiT Points Summary, but how it is to be achieved is not mentioned in the 1391. No comment on the 2 SPiRiT points

5.C4 Low-Emitting Materials (2)

- Intent: Reduce the quantity of indoor air contaminants that are odorous or potentially irritating to provide installer and occupant health and comfort.
- Requirement: Meet or exceed VOC limits for adhesives, sealants, paints, composite wood products, and carpet systems as follows:
- ☐ Adhesives must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 by, AND all sealants used as a filler must meet or exceed Bay Area Air Resources Board Reg. 8, Rule 51.
 - ☐ Paints and coatings must meet or exceed the VOC and chemical component limits of Green Seal requirements.
 - ☐ Carpet systems must meet or exceed the Carpet and Rug Institute Green Label Indoor Air Quality Test Program.
 - ☐ Composite wood or agrifiber products must contain no added urea-formaldehyde resins.
- Technologies /Strategies: Evaluate and preferentially specify materials that are low emitting, non-irritating, nontoxic and chemically inert. Request and evaluate emissions test data from manufacturers for comparative products. Ensure that VOC limits are clearly stated in specifications, in General Conditions, or in each section where adhesives, sealants, coatings, carpets, and composite woods are addressed.

Comments

- 5.C.4.3
Johnson/
Stumpf OK - the 1391 has no indication of the type of carpet. Be sure to make this indication in the contract documents. Is the amount set aside for carpet in the 1391 sufficient for low-VOC carpeting (as this cannot be extrapolated directly)?
- Pellegrin/LEED™ Credit 4 - Low Emitting Materials -

There are many sealants, paints, and adhesives that all contain low or no volatile organic compounds (VOCs). This point is easily attainable with careful attention to the selection of sealants, paints, etc. Make sure the low VOC requirement is written clearly in the specs.

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5.C5 Indoor Chemical and Pollutant Source Control (1)

Intent: Avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality.

Requirement: ☐ Design to minimize cross-contamination of regularly occupied areas by chemical pollutants:

- Employ permanent entryway systems (grills, grates, etc.) to capture dirt, particulates, etc. from entering the building at all high volume entryways, AND provide areas with structural deck to deck partitions with separate outside exhausting, no air recirculation and negative pressure where chemical use occurs (including housekeeping areas and copying/print rooms), AND provide drains plumbed for appropriate disposal of liquid waste in spaces where water and chemical concentrate mixing occurs.

Technologies Strategies: Design to physically isolate activities associated with chemical contaminants from other locations in the building, providing dedicated systems to contain and remove chemical pollutants from source emitters at source locations. Applicable measures include eliminating or isolating high hazard areas; designing all housekeeping chemical storage and mixing areas (central storage facilities and janitors closets) to allow for secure product storage; designing copy/fax/printer/printing rooms with structural deck to deck partitions and dedicated exhaust ventilation systems; and including permanent architectural entryway system(s) to catch and hold particles to keep them from entering and contaminating the building interior. Consider utilization of EPA registered anti-microbial treatments in carpet, textile or vinyl wall coverings, ceiling tiles or paints where microbial contamination is a concern. Utilize "breathable" wall finishes where circumstances require, to reduce moisture build-up and prevent microbial contamination. Minimize selection of fibrous materials, e.g., insulation, carpet and padding and flexible fabrics, whose exposed surfaces when exposed to the air stream or occupied space can contribute significant emissions and absorb and re-emit other contaminants over time.

Comments

5.C5.1 None

Pelle-grin/LEED™ Credit 5- Indoor Chemical & Pollutant Source Control-

Attainable point. One simple step toward getting this credit is to install walk-off mats (like very rough doormats) in high traffic entryways to reduce particulate matter inside building. Also, areas with a lot of chemical storage or use (i.e., cleaning chemical storage, copy rooms) should be vented separately from the rest of the air circulation system to prevent cross-contamination with office air.

5.C6 Controllability of Systems (2)

Intent: Provide a high level of individual occupant control of thermal, ventilation, and lighting systems to support optimum health, productivity, and comfort conditions.

Requirement: ☐ Provide a minimum of one operable window and one lighting control zone per 200 sq ft for all occupied areas within 15 ft of the perimeter wall.

☐ Provide controls for each individual for airflow, temperature, and lighting for 50% of the non perimeter, regularly occupied areas.

Technologies /Strategies: Provide individual or integrated controls systems that control lighting, airflow, and temperature in individual rooms and/or work areas. Consider combinations of ambient and task lighting control and operable windows for perimeter and VAV systems for non perimeter with a 1:1: 2 terminal box to controller to occupant ratio.

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Comments

- 5.C6.1 Schneider Provision of individual occupant controls over thermal, ventilation, and lighting systems may not be as easy as indicated in the charrette documents. As a minimum, any special provisions for these controls need to be reflected in project costs.
- Operable windows are generally not included in typical administrative buildings and therefore Exterior Closure cost/SF. Costs for operable windows are not apparent in the detailed cost estimate unless included in 'Exterior Aluminum Windows.' Confirm inclusion and quantity in SF in the cost estimate].
- Similarly, individual controls over airflow and temperature typically come at a higher price, especially for cubicles in an open plan office space. Again, these control costs are not included in typical administrative buildings cost/SF. A general statement indicating that the project will include individual thermal controls for personal comfort is made, but cost and/or special systems requirements are not evident in the 1391. [The single line item in the detailed cost estimate for HVAC systems controls is the standard TRACES cost/SF for an administrative facility, and inadequate in itself, however, allowance has been made for individual controls under the detailed line item HVAC Air Distribution. The quantities of the various control methods, e.g., 'Under Floor Air diffusers,' 'Power & Control Modules,' and 'Thermostats' seem inconsistent in quantity required/Occupant. Confirm quantities necessary to achieve LEED™/SPiRiT and verify in estimate].
- Johnson/Stumpf 5.C6.1 This credit must be carefully considered when designing the building!
- Pellegrin/LEED™ Credit 6 - Controllability of Systems -
- As currently planned, 2 points should be awarded in this area. With the raised flooring, every employee will be able to adjust their individual airflow and heating, granting you a point in this area. The use of operable windows and lighting controls (along with diffusers with manual override) should ensure that the other point is awarded.
- 5.C6.2 Schwenk It is not evident that controls will be provided for each individual for airflow, temperature, and lighting for 50% of the non-perimeter, regularly occupied spaces. May be too much detail for a 1391. Manually adjustable floor diffusers may meet the cooling and airflow requirements (will be up to the discretion of the SPiRiT rater), but may not meet the heating requirement. Is there (individual) task lighting? The SPiRiT point is in question.

5.C7 Thermal Comfort (2)

- Intent: Provide for a thermally comfortable environment that supports the productive and healthy performance of the building occupants.
- Requirement: ☐ Comply with ASHRAE Standard 55-1992, Addenda 1995 for thermal comfort standards including humidity control within established ranges per climate zone.
- ☐ Install a permanent temperature and humidity monitoring system configured to provide operators control over thermal comfort performance and effectiveness of humidification and/or dehumidification systems in the building.
- Technologies /Strategies: Integrated envelope and HVAC system design strategies that achieve thermal comfort conditions based on mean radiant temperature, local air velocity, relative humidity, and air temperature. Install and maintain a temperature and humidity monitoring system for key areas of the building (i.e., at the perimeter, and spaces provided with humidity control). This function can be satisfied by the building automation system. Specify in system operation manuals that all sensors require quarterly calibration. Include criteria verification and system operation in commissioning plan and report.

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Comments

5.C7.1 None

Pelle-
grin/LEED™ Credit 7 - Thermal Comfort -

Attainable point. Work with the appropriate engineer to design a system that allows an environment complying with the ASHRAE thermal comfort standard. Installing a monitoring system for the thermal comfort will gain another point. Two points are easily possible in this category.

5.C7.1
and
5.C7.2
Schwenk

A UMCS will likely be required to monitor and log the required data. Refer to UMCS description/comment in 3.C1. If UMCE is included and relative humidity sensors, SPiRiT point should be awarded.

- These are miscellaneous questions/issues related to comfort control:
- Will the controls be designed to avoid simultaneous heating and cooling, where heating is via radiant panels and cooling is from the heat pump? If the controls are not interlocked/coordinated, the heating and cooling systems may fight with each other.
- Will heat pump 64 °F supply air provide adequate cooling capacity? 55 °F is typical supply air temperature.
- Do heat pumps provide adequate dehumidification/latent heat transfer?
- Will 0.20 iwc support the required diffuser throw?

Johnson/
Stumpf

5.C7.2 Humidity control issues were discussed earlier in this evaluation. Temperature controls directly affect humidity. Without individual humidity control, there can be no guarantee of thermal comfort.

5.C8**Daylight and Views (2)**

Intent: Provide a connection between indoor spaces and the outdoor environment through the introduction of sunlight and views into the occupied areas of the building.

- Requirement:
- ☐ Achieve a minimum Daylight Factor of 2% (excluding all direct sunlight penetration) in 75% of all space occupied for critical visual tasks, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. Exceptions include those spaces where tasks would be hindered by the use of daylight or where accomplishing the specific tasks within a space would be enhanced by the direct penetration of sunlight.
 - ☐ Direct line of sight to vision glazing from 90% of all regularly occupied spaces, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas.

Technologies /Strategies: Implement design strategies to provide access to daylight and views to the outdoors in a glare-free way using exterior sun shading, interior light shelves, and /or window treatments. Orient buildings to maximize daylighting options. Consider shallow or narrow building footprints. Employ courtyards, atriums, clerestory windows, skylights, and light shelves to achieve daylight penetration (from other than direct effect or direct rays from the sun) deep into regularly occupied areas of the building.

Comments

5.C8.1
Schneider

While daylighting strategies were addressed to a limited extent in the 1391 planning charrette report (60-foot width, multiple buildings or single floor, skylights and light shelves), the concept design layouts, site orientation, and overall concept configuration do not appear to be optimized for daylight penetration into either open plan office spaces, or what are assumed to be 'hard walled' interior office spaces. Direct line of sight may be similarly restricted, albeit, to a lesser extent. If concept design drawings are to become a part of the detailed 1391, they should be more indicative of the anticipated/desired facilities siting, orientation, and configuration.

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5.C8.2 Schneider While not a SPiRiT/LEED™ requirement, consideration should be given to the provision of daylight in spaces not regularly occupied such as copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas.

Pellegrin/LEED™ Credit 8- Day lighting & Views-
These two points are attainable with proper architectural design. The somewhat modular design of the building (two wings flanking the auditorium area) and the day lighting in the upper auditorium should help achieve this credit. Architects should be made aware that day lighting and views are desired so that the building is designed properly with light shelves, etc. I highly recommend putting a priority on these two points since day lighting in offices has been shown to improve employee production and attendance significantly. Again, cut sheets are probably the simplest way to document these points.

5.C8.1 and
5.C8.2 Johnson/
Stumpf OK - but this must be demonstrable in the contract documents.

5.C9 Acoustic Environment /Noise Control

Intent: Provide appropriate acoustic conditions for user privacy and comfort.

Requirement: ☐ Minimize environmental noise through appropriate use of insulation, sound-absorbing materials and noise source isolation.

Technologies /Strategies: Evaluate each occupied environment and determine the appropriate layout, materials and furnishings design.

Comments

5.C9.1 Johnson/
Stumpf OK - sound insulation must be eventually indicated in the plans. CERL did not see money allocated for sound-deadening materials (i.e., Homasote and others). Acoustic tile ceilings on their own are not adequate for achieving this credit.

5.C10 Facility In-Use IAQ Management Plan

Intent: Ensure the effective management of facility air quality during its life.

Requirement: ☐ Perform all of the following:

- Develop an air quality action plan to include scheduled HVAC system cleaning.
- Develop an air quality action plan to include education of occupants and facility managers on indoor pollutants and their roles in preventing them.
- Develop an air quality action plan to include permanent monitoring of supply and return air, and ambient air at the fresh air intake, for carbon monoxide (CO), carbon dioxide (CO₂), total volatile organic compounds (TVOCs), and particulates (including PM₁₀).

Technologies /Strategies: Provide action plan for periodic system maintenance, monitoring, occupant/manager training.

Comments

5.C10.1 Schneider Costs for the development of a Facility In-Use IAQ Management Plan need to be included in the project budget. While these are costs not strictly project 'design' related, I recommend that they be included under Tab B, "Planning and Design Data" as 'All Other Design Costs.' This is part of an 'owner's manual' to be provided to the facilities owners/operators so that they can maintain a high level of air quality over time.

Schwenk Credit is shown in the SPiRiT Points Summary, but how it is to be achieved is not mentioned in the 1391. A UMCS will likely be required to monitor and log the required data. Refer to UMCS description/comment in 3.C1. Also, some of the required permanent monitoring instrumentation can be expensive and the SPiRiT point may not be cost justified. Perhaps credit can be obtained in the absence of some of the referenced instrumentation if rationale is provided for not providing the instrumentation.

6.0 Facility Delivery Process

6.C1 Holistic Delivery of Facility

Intent: Encourage a facility delivery process that actively engages all stakeholders in the design process to deliver a facility that meets all functional requirements while effectively optimizing tradeoffs among sustainability, first costs, life cycle costs and mission requirements.

- Requirement:
- ☐ Choose team leaders that are experienced in holistic delivery of facilities.
 - ☐ Train the entire team in the holistic delivery process. The team must include all stakeholders in the facility delivery, including the users, the contracting staff, the construction representatives, project manager, and design/engineering team members.
 - ☐ Identify project goals and metrics.
 - ☐ Plan and execute charrettes with team members at critical phases of the facility delivery.
 - ☐ Identify and resolve tradeoffs among sustainability, first costs, life cycle costs and mission requirements through charrettes and other collaborative processes.
 - ☐ Document required results for each phase of project deliverables that achieve the project goals and are measurable throughout the facility life span.

Technologies /Strategies: Develop performance specifications or choose competitive range of products that meet environmental criteria.

Use automated modeling and analysis tools to assess site and facility design alternatives.

Conduct life-cycle cost analysis (LCCA) in the design process according to the Federal Facilities Council Technical Report, Sustainable Federal Facilities: A Guide To Integrating Value Engineering, Life Cycle Costing, and Sustainable Development, FFC # 142, 2000.

Conduct a full ecological assessment to include soil quality, water resources and flows, vegetation and trees, wildlife habitats and corridors, wetlands, and ecologically sensitive areas to identify the least sensitive site areas for development. Evaluate space utilization/functions to reduce overall space requirements, considering networking, flextime, flexi-place, dual-use, and other strategies to reduce space requirements/optimize facility size.

Comments

6.C1.1 Schneider Costs for a 'holistic' facility delivery process need to be considered in the project budget, albeit, experience to date has shown there to be little or no additional costs. Training of all stakeholders on the process and on sustainable design is typically conducted at the project kick-off meeting. Sustainable design goals and objectives are, in this case, reviewed and or revised at the project kick-off meeting. Review of progress towards established goals and objectives, Standard design requirements to be While these are costs not strictly project 'design' related, I recommend that they be included under Tab B, "Planning and Design Data" as 'All Other Design Costs.' This is part of an 'owners manual' to be provided to the facilities owners/operators so that they can maintain a high level of air quality over time.

6.C1.2 Schneider This credit does not apply to LEED™, however, any of the credits in SPiRiT not present in LEED™ may be eligible for one LEED™ point under 'Innovation in Design.'

7.0 Current Mission

7.C1 Operation and Maintenance

Intent: Encourage the development of a facility delivery process that enhances efficient operation and maintenance of the facility.

- Requirement: ☐ Develop a facility operations and maintenance program to include:
- Commissioning instructions for all facility systems.
 - Comprehensive facility operations and maintenance instructions for system operation, performance verification procedures and results, an equipment inventory, warrantee information, and recommended maintenance schedule. The instructions should include a comprehensive, preventive maintenance program to keep all facility systems functioning as designed.
 - A periodic training program for occupants, facilities managers, and maintenance staff in all facility operations and maintenance activities.
 - Instructions on sustainable cleaning and pest control practices.
 - Develop a comprehensive site/facility recycling/waste management plan.
- ☐ Provide surfaces, furnishings, and equipment that are appropriately durable, according to life cycle cost analysis.

Technologies /Strategies: Maintain facility elements, systems and subsystems on a routine maintenance schedule to ensure integrity and longevity.

Perform scheduled cleaning and maintenance activities with nontoxic environmentally preferable cleaning products and procedures. Keep air ducts clean and free of microorganisms through a structured program of preventive maintenance. Clean lighting systems following a regular maintenance schedule to ensure optimum light output and energy efficiency.

Use pesticides and herbicides sparingly and only when necessary with preference to natural methods and materials over poisons and toxic agents.

Use automated monitors and controls for energy, water, waste, temperature, moisture, and ventilation monitors and controls. Turn off the lights, computers, computer monitors, and equipment when not in use. Enable power-down features on office equipment.

Comments

7.C1.1
Schneider To meet the intention of this SPiRiT credit, development of a facilities 'owner's manual' including the appropriate instructions, training plans/materials, and plans is essential. Costs for the development of these materials need to be included in the project budget. While these are costs not strictly project 'design' related, I recommend that they be included under Tab B, "Planning and Design Data" as 'All Other Design Costs.' (See related comment under 'Facility In-Use IAQ Management Plan' above).

7.C1.2
Schneider This credit does not apply to LEED™, however, any of the credits in SPiRiT not present in LEED™ may be eligible for one LEED™ point under 'Innovation in Design.'

Johnson/
Stumpf 7.C1.1 OK - be sure to set aside funds for the completion of this maintenance program.

7.C1.2 OK - what are the materials being selected for flooring and furnishings?

7.C2 **Soldier and Workforce Productivity and Retention**

Intent: Provide a high-quality, functional, healthy and safe work environment to promote soldier and workforce productivity and retention.

- Requirement: ☐ Provide a high quality indoor environment to enhance user/occupant quality of life (QOL).
- ☐ Provide a highly functional work environment to promote user/occupant work productivity.
- ☐ Provide a healthy and safe work environment to sustain QOL and productivity.

Technologies /Strategies: Use a registered/certified interior designer to provide stimulating interior environments with pleasant colors, surface treatments, room proportions and ceiling heights, external views, natural lighting, and quality detailing for interior furnishings, equipment, materials and finishes. Use IES standards to provide light to occupied space with variations in level, comfortable contrasts, natural color rendition, natural/man-made, and adequate controls to optimize light aesthetic qualities. Provide occupant control of individual work areas configuration, and lighting, thermal and ventilation systems.

Collaborate with end users to identify functional and technical requirements and to perform adjacency studies. Configure occupied space to address the specific workers/occupants functions and activities that will be carried out there. Meet TI 800-01 Design Guide requirements. Design and configure occupied space, and select furniture and equipment using human ergonomics. Identify existing user amenities, such as dining, recreation, socialization, shopping and child care facilities. Identify what amenities should be incorporated into the project or provided in the future, nearby facility. Provide ventilation air in sufficient volume free from natural and man made contaminants.

Comments

7.C2.1 Schneider This credit does not apply to LEED™, however, any of the credits in SPiRiT not present in LEED™ may be eligible for one LEED™ point under 'Innovation in Design.'

8.0 Future Missions

8.C1 Functional Life of Facility and Supporting Systems

Intent: Assess the functional life of a facility and its supporting systems to optimize the infrastructure investment.

Requirement: ☐ Identify how long the designed function is likely to occupy the current facility.

☐ Identify how long the envelope, structure, HVAC, plumbing, communications, electrical, and other systems are likely to last before requiring replacement or upgrade. Consider economic, functional and physical obsolescence.

Technologies /Strategies: Assess the typical or likely lifespan of the function(s) to be accommodated to forecast eventual adaptation to a different use(s). Assess the life spans of the various building systems/components to forecast their revision/replacement during the facility lifespan and design in a manner that facilitates revision/replacement.

Consider the life span of the weapon systems, doctrines, or other programs supported by the facility.

Use life cycle data and other sources to identify the life span of the embodied systems.

Comments

8.C1.1 Schneider This should be part of the projects design analyses.

8.C1.2 Schneider This credit does not apply to LEED™, however, any of the credits in SPiRiT not present in LEED™ may be eligible for one LEED™ point under 'Innovation in Design.'

8.C1.1 and 8.C1.2 Johnson/Stumpf OK - be sure to include information to about the building's functional life and systems in the contract documents.

8.C2 Adaptation, Renewal and Future Uses

Intent: Encourage facility design that is responsive to change over time to maximize accommodation of future uses without creating waste and insuring maximum useful life of products.

Requirement: ☐ Identify possible future uses for the facility; consider alternatives that expand the list of possible future uses. AND Design the building to accommodate as wide a range of future uses, as practical. AND Design the installation of building systems to accommodate foreseeable change with a minimum amount of disruption, cost, and additional materials.

- ❑ Build the smallest facility necessary to meet current mission functional requirements, using the most efficient shape and form, while taking into consideration expansion capabilities and potential future mission requirements. AND Design the facility for recycling of materials and systems.

Technologies /Strategies: Create durable, long-lasting and adaptable facility shell and structural system. Create an adaptable, flexible facility design using open planning, service corridors, interstitial space, access floors, demountable walls/partitions, modular furniture and other adaptable space configuration/utilization strategies.

Select materials that are recyclable, avoiding composite materials, such as reinforced plastics and carpet fibers and backing. Consider selecting materials and labeling construction materials with identification information to facilitate recycling. Use pre-cut/pre-fabricated materials and use standard lengths and sizes (dimensional modularity) in design. Design facility systems and subsystems for reconfiguration and/or disassembly/recycling using reversible/reusable connectors.

Comments

8.C2.1
Schneider This should be part of the projects design analyses.

8.C2.2
Schneider This credit does not apply to LEED™, however, any of the credits in SPiRiT not present in LEED™ may be eligible for one LEED™ point under 'Innovation in Design.'

Annex A1: Waste Management Plan

WASTE MANAGEMENT PLAN

3.1 Recycling Implementation

1) General

Soltek Pacific and its subcontractors shall ensure that as much as is economically feasible of the waste that is generated for this project, shall be recycled in order to divert the maximum waste from public landfill or incinerator. Soltek will ensure that the mandatory requirements of the Waste Management Plan are communicated to all its subcontractors and implement job-site procedures that will minimize mishandling and contamination of recyclable waste.

Overall, projected Construction and Demolition (C&D) Waste for the project will be re-used or source separated. Approximately 98% of projected Total C&D Waste will be diverted from the landfill through Demolition re-use and recycling of New Construction waste. Approximately 60% of New Construction Waste is projected to be source separated on-site for off-site recycling at an approved Recycling Center. The remaining 40% will be collected on-site for floor separation by Marborg Industries at their facility and then transported to Recycling Centers. Approximately 25% of total New Construction Waste is projected to be landfilled.

The Soltek Pacific Project Engineer has been designated as the Recycling Manager to oversee the mandatory recording and documentation of Recycled and Landfilled quantities provided by Subcontractors with their Payment Applications. The Recycling Manager will summarize monthly results of Waste Management and Recycling Documentation and report progress of the Waste Management Plan at regular project meetings.

2) Meetings

The Soltek Pacific Project Superintendent will be responsible for overseeing construction worker compliance with the Waste Management Plan. The Superintendent will instruct all Subcontractor Superintendents and Foremen in the appropriate separation, handling and recycling procedures to be used by all parties. Foremen will be responsible for instructing their workers regarding separation, handling and recycling procedures. The Project Superintendent will address the Waste Management Plan and recycling compliance at weekly job-site meetings.

3) Separation/Handling/Transportation

Subcontractors will be required to remove Recyclable waste from site to one of the Recycling Center listed in the Contract Documents or other approved Recycling Center.

Soltek Pacific will allocate space on-site for Subcontractor-provided Recycling Containers as follows:

- | | | |
|-------------------------------|-----------------|---------|
| • Clean Concrete, Bricks, CMU | 17 yd Container | one (1) |
| • Clean Drywall | 40 yd Container | one (1) |
| • Clean Metal | 17 yd Container | one (1) |

Total On-site S/C Containers Three (3)

In addition to the Subcontractor provided bins, Soltek Pacific will provide on-site containers, transportation and handling as follows:

- | | | |
|------------------------------|-----------------|----------------|
| • Mixed Recyclable Materials | 40 yd Container | one (1) |
| • Refuse | 11 yd Container | <u>one (1)</u> |

Total Soltek Provided Containers Two (2)

Soltek Pacific and its Subcontractors will dispose of the following recyclable materials in UCSB recycling containers on or near the construction site:

- Clean Cardboard
- Beverage Containers
- Office Paper

4) Documenting Weight Tickets for Actual Recycled and Landfilled Waste

All contractors shall submit a Construction Waste Management Summary (See Exhibit ii) along with weight tickets along with each Payment Application. If no containers are removed from the site in a given pay period, the summary shall so indicate. Weight tickets shall indicate actual quantities from approved Recycling Centers and Landfill Facilities utilized as follows:

- Subcontractor Payment Applications shall include weight tickets for actual quantities of material collected and transported from on-site containers.
- For Materials that are re-used on site, Subcontractors may submit letters of attestation in lieu of weight tickets with the Construction Waste Management Summary
- Weight tickets shall also be provided for all contractor-generated recycled and landfilled waste that is removed immediately from the site rather than being collected in on-site bins.

Projected Waste Generation Quantities & Recycling Cost Analysis
See Exhibit iii, Recycling Estimate.

3.3 Non-Recyclable Waste Handling and Disposal

1) Solid Waste

All solid waste that cannot be recycled will be collected in on-site bins and transported to the landfill site in accordance with local, state and federal requirements.

1) Chemical/Hazardous Wastes

Any excess concrete curing compounds, paints, solvents, fuel, oil, grease or pesticides will be disposed of at the UCSB Household Hazardous Waste Facility or other local facility. Empty canisters will be placed in refuse containers designated for chemical waste materials and will be clearly marked. Containers will be plastic lined, watertight and no other types of waste will be co-mingled in the designated refuse containers. Motor oil or other equipment fluids generated from the maintenance of jobsite vehicles or equipment will be stored in corrosion resistant drums and disposed of at local centers accepting used motor oil.

3) Domestic Sanitary Waste

Refuse containers, transportation and handling and portable toilets will be provided by Soltek Pacific using Marborg Industries. Office trailers will be tied into the campus sanitary sewage system.

Annex A2: Waterless Urinals Sample Project Details

Waterless Urinals Sample Project Details

North Island Naval Air Station, San Diego, CA - Installed 12 Waterless urinals in February of 1995. They received funding in June of '96 and installed 217 Waterless urinals in NADEP area. Payback is 4.5 years. POC - Jose Jimenez - (619)545-2238

NASA/JPL, Pasadena, CA - Installed 9 Waterless urinals on 10-10-94. Installed 130 Waterless urinals on 11-27-95. Bought another 115 Waterless urinals on 8-5-96. Excellent payback of 2.18 years.

POC - John Griffin - (818)354-3522

U.S. Army Fort Huachuca, AZ

Installed 3 Waterless urinals on 8-28-96. They received funding through a bold grants program at their Training and Doctrine Command, Fort Monroe. They have excellent payback of about 2 years, and retrofitted 35 high use areas with 235 Waterless urinals in August of '97. In 1999 they received special environmental funding and will be retrofitting 400-500 more Waterless urinals in the next 3-4 years. POC - Craig Hanson - (520)533-1866

Goodfellow Air Force Base, TX –

Installed 3 Waterless urinal in July of 1997. They now have over 40 waterless urinals after procuring 21 more in March of 1999. The base will be installing another 140 Waterless urinals in late 1999 as part of an Energy Savings Performance Contract with SEMPRA. Payback 3.6 yrs.

U S. Merchant Marine Academy, Kings Point, NY - Installed 13 Waterless urinals in July of 1996. Procured 50 more Waterless urinals in October of 1996.

National Park Service

There are currently about 30 N.P.S. and B.O.R. projects going. These includes major facilities such as Yellowstone and Grand Canyon National Parks.

U.S. Postal Service, P&D Facility, Stockton, CA

Installed 17 waterless urinals to completely retrofit their facility in April of '97. Payback 1.5 years.

U.S. Army Proving Grounds, Yuma, AZ

Installed 1 Waterless urinal on 4-23-97. Their base energy manager submitted a project to retrofit their entire base with about 170 Waterless urinals. Payback 1.3 years - SIR is 10.5.

Jacksonville Naval Air Station, FL

Installed 4 Waterless urinals on 10-14-96. The urinals were installed in their PWC, next to a main meeting room where many Admirals meet. Their base energy manager recently got the word from his S.C.E, Commander Scott, and the base Commanding Officer, Captain Whitmire, to move "full ahead" with retrofitting the base. Payback 2.28 years.

United States Postal Service, P&D Center, Brockton, MA

Installed 17 waterless urinals to completely retrofit their facility in August of '98.

SIMA-32 Street Naval Base, San Diego, CA

Installed 47 Waterless urinals in October of '96. Excellent payback of just over one year.

Kirtland Air Force Base, Albuquerque, NM

Installed 3 Waterless urinals on 7-30-96. They are now spec'ed for all renovation and new construction projects. The DOE facility there has spec'ed Waterless urinals in a major renovation project that includes about 40 Waterless urinals.

U.S. Army, PTA Center, Hilo, HI

Installed 8 Waterless urinals on 4-10-97. In June of '97 they installed

34 Waterless urinals to retrofit the rest of their facility.

Marine Corps Air Station, Yuma, AZ

Installed 7 Waterless urinals in March of '96. Procured 20 more Waterless urinals in September of '97. Procured 18 more waterless urinals in August of '98. Their base energy manager submitted a project to Marine Corps HQ for 98 more Waterless urinals. Payback is about 2.5 years.

Partial List of Schools Using Waterless No-Flush™ Urinals (May 2002)

Bowie School District, Bowie, AZ	Carlsbad USD, Carlsbad, CA
Flowering Wells SD, Tucson, AZ	Coachella Valley USD, Thermal, CA
Hermosa Montessori School, Tucson, AZ	Compton USD, Compton, CA
Marana High School, Marana, AZ	Conejo Valley USD, Thousand Oaks, CA
Nadaburg Elementary, Wittmann, AZ	Cuyamaca College, El Cajon, CA
Sahuarita USD, Sahuarita, AZ	El Centro ESD, El Centro, CA
Show Low Schools, Show Low, AZ	El Centro UHSD, El Centro, CA
Sierra Vista Public Schools, Sierra Vista, AZ	Elk Grove USD, Sacramento, CA
St. David USD, St. David, AZ	Escondido UHSD, Escondido, CA
Tanque Verde SD, Tucson, AZ	Eureka City Schools, Eureka, CA
Tombstone USD, Tombstone, AZ	Fontana USD, Fontana, CA
Tucson USD, Tucson, AZ	Fullerton School District, Fullerton, CA
University of Arizona, Tucson, AZ	Glendale USD, Glendale, CA
Alameda USD, Alameda, CA	Glendora USD, Glendora, CA
Alhambra USD, Alhambra, CA	Hawthorne School District, Hawthorne, CA
Alta Loma EUSD, Alta Loma, CA	Hemet USD, Hemet, CA
Barstow USD, Barstow, CA	Hesperia USD, Hesperia, CA
Beaumont USD, Beaumont, CA	Hueneme USD, Port Hueneme, CA
Cabrillo College, Soquel, CA	Inglewood USD, Inglewood, CA
Cajon Valley USD, El Cajon, CA	La Mesa School District, San Diego, CA

Lancaster ESD, Lancaster, CA	Haralson County Schools, Buchanan, GA
Lawndale ESD, Lawndale CA	CSD of South Tama, Tama, IA
Lucia Mar USD, Arroyo Grande, CA	Harland Community College, Harlan, IA
Monrovia USD, Monrovia, CA	Boise City Schools, Boise, ID
Moreno Valley USD, Moreno, CA	Bloomington Schools, Bloomington, IL
Motherlode USD, Placerville, CA	Lincoln Com. High School, Lincoln, IL
Newport Mesa USD, Costa Mesa, CA	IVY Tech, IN
Oak Valley USD, Oak Valley, CA	Valparaiso University, Valparaiso, IN
Olinda School District, Brea, CA	Henderson County Schools, Henderson, KY
Ojai USD, Ojai, CA	Avon Public School, Avon, MA
Orange USD, Orange, CA	Blackstone Valley RVOT, Upton, MA
Paramount USD, Paramount, CA	Boston College HS, Boston, MA
Pomona USD, Pomona, CA	Braintree High School, Braintree, MA
Ramona USD, Ramona, CA	Community College of Baltimore County,
Rowland USD, Rowland Heights, CA	Catonsville, MA
Sacramento USD, Sacramento, CA	Diman Vocational High School, Fall River, MA
Saddleback College, Mission Viejo, CA	Gateway Reg. SD, Huntington, MA
San Diego City Schools, San Diego, CA	Northeastern University, Boston, MA
San Dieguito UHSD, Encinitas, CA (Oldest school installation in country, since 3/93.)	Shackleton School, Ashby, MA
San Marcos USD, San Marcos, CA	Catonsville College, Catonsville, MD
Santa Maria High School, Santa Maria, CA	Cecil Comm. College, North East, MD
Simi Valley USD, Simi, CA	Frederick County Public Schools, Frederick, MD
Solvang Elementary SD, Solvang, CA	Harford Community College, Bel Air, MD
South Bay USD, Imperial Beach, CA	Michigan State University, E. Lansing, MI
Stanford University, Stanford, CA	Michigan University, Marquette, MI
Temple City USD, Temple City, CA	Saginaw Valley State University, MI
Thousand Oaks High School, Thousand Oaks, CA	Western Michigan University, Kalamazoo, MI
UC Berkeley, Berkeley, CA	Minnetonka High School, Minnetonka, MN
UC Santa Barbara, Santa Barbara, CA	Hickory City Schools, Hickory, NC
Ventura County Board of Education, CA	University of North Carolina, Asheville, NC
Victor Valley Union HSD, Victorville, CA	Mercer Community College, NJ
Vista USD, Vista, CA	Espanola Public Schools, Espanola, NM
West Covina USD, West Covina, CA	Floyd Municipal Schools, Floyd, NM
Westside School District, Quartz Hill, CA	Moriarty Schools, Moriarty, NM
Yuba City USD, Yuba City, CA	U. S. Merchant Marine Academy, Great Neck, NY
University of CA Washington, DC	Case Western University, Cleveland, OH
Clay County Schools, Green Cove Spring, FL	Medical College of Ohio, Toledo, OH
Hillsboro County SD, Hillsboro, FL	Lone Grove Public Schools, Lone Grove, OK
Pensacola Christian College, Pensacola, FL	Central Fulton School District, PA
Bartow County Schools, GA	Dover Area School District, Dover, PA
Cherokee County Schools, Canton, GA	Hanover Public Schools, Hanover, PA
Cobb County Schools, Marietta, GA	Harrisburg Are Com. College, Harrisburg, PA
Emanuel County Board of Education Swains- boro, GA	Kutztown University, Kutztown, PA
Floyd County Schools, Rome, GA	Middle Bucks Inst. of Tech., Jamison, PA
Halvert County Schools, GA	Swarthmore College, Swarthmore, PA
	Greenwood County SD 52, Greenwood, SC

Pellissippi State College, Knoxville, TN
Bay City ISD, Bay City, TX
El Paso School District, El Paso, TX
Houston ISD, Houston, TX
University of Texas Health Center, Houston, TX
Provo School District, Provo, UT
Radford University, Radford, VA
University of Virginia, Charlottesville, VA
Virginia Tech, Blacksburg, VA
University of Wisconsin, Green Bay, WI
Bellevue Community College, Bellevue, WA
Bremerton SD, Bremerton, WA
Central Washington University, Ellensburg, WA
Evergreen State College, Olympia, WA
Federal Way Public Schools, Federal Way, WA
Highline Community College, Des Moines, WA
Kent School District, Kent, WA
Lake Washington SD, Redmond, WA
North Kitsap School District 400, Poulsbo, WA
North Shore School District, Bothell, WA
Oak Harbor SD, Oak Harbor, WA
Peninsula School District, Gig Harbor, WA
Seattle School District, Seattle, WA
South Puget Sound Community College,
Olympia, WA
Whitworth College, Spokane, WA
Washougal School District, Washougal, WA
Fairmont State College, Fairmont, WV
Waterless Co. LLC 1-888-NOFLUSH
SAN DIEGO, CA 92014
WWW.WATERLESS.COM

Appendix B: Water Baseline and Design Analysis Using LEED™ Spreadsheet

leedwaterAEC1.xls

WE Credit 2: Innovative Wastewater Technologies

LEED Requirement

WE Credit 2.0: Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of **50%**, OR, treat **100%** of wastewater on site to tertiary standards. (1 point)

Instructions

1. First, complete the Design Case Table by listing all of the fixture types in the project using the pulldown menus. If the fixture with the appropriate flow rate is not listed, select "Other" and manually input the flow rate in gallons per flush [GPF]. For unused columns, select "--" from the pulldown menu. If additional rows are needed, use the Insert/Rows command between the existing rows. Estimate the number of male and female uses per day for each fixture type. The number of male and female occupants is automatically carried over from the information provided on the introduction sheet.
2. If the project uses a graywater or stormwater reuse system that is applicable to the fixtures in the table, input the annual volume provided by this system. The table automatically calculates the total annual volume of sewage generated.
3. Input similar information in the Baseline Case Table, changing the types of sewage generating fixtures and their associated flow rates as appropriate. See the Reference Guide for information on how to estimate the Baseline Case. Do not change the number of building occupants, the number of workdays, or the frequency of use data. Do not include graywater or rainwater harvest volumes in the Baseline Case.
4. Compare the amount of reduction to the LEED requirement listed above to determine if the project can qualify for the credit.

leedwaterAEC1.xls

WE Credit 2: Innovative Wastewater Technologies**Design Case**

Fixture Type	Daily Uses	Flow Rate [GPF]	Occupants	Sewage Generation [gal]
Ultra Low-Flow Water Closet ▾				
Male	1	0.8	225	180
Female	5	0.8	225	900
Composting Toilet ▾				
Male		0.0	0	0
Female		0.0	0	0
Waterless Urinal ▾				
Male	4	0.0	225	0
Female		0.0	0	0
Other ▾				
Male		0.0	0	0
Female		0.0	0	0
- ▾				
Male		0.0	0	0
Female		0.0	0	0
Total Daily Volume [gal]				1,080
Annual Work Days				250
Annual Volume [gal]				270,000
Graywater or Stormwater Reuse Volume [gal]				
TOTAL ANNUAL VOLUME [gal]				270,000

leedwaterAEC1.xls

WE Credit 2: Innovative Wastewater Technologies**Baseline Case**

Fixture Type	Daily Uses	Flow Rate	Occupants	Sewage Generation
		[GPF]		[gal]
Water Closet				
Male	1	1.6	225	360
Female	5	1.6	225	1,800
Urinal				
Male	4	1.0	225	900
Female		1.0	0	0
Total Daily Volume [gal]				3,060
Annual Work Days				250
TOTAL ANNUAL VOLUME [gal]				765,000

Wastewater Generation Reduction**65%****Fixture Chart**

Fixture	
	[GPF]
Conventional Water Closet	1.6
Low-Flow Water Closet	1.1
Ultra Low-Flow Water Closet	0.8
Composting Toilet	0.0
Conventional Urinal	1.0
Waterless Urinal	0.0
Other	
-	

leedwaterAEC1.xls

WE Credit 3: Water Use Reduction**LEED Requirements**

WE Credit 3.1: Employ strategies that in aggregate use **20%** less water than the water use baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements. (1 point)

WE Credit 3.2: Exceed the potable water use reduction by an additional 10% (30% total efficiency increase). (1 point)

Instructions

1. First, complete the Design Case Table. This table is divided into two sections to differentiate between flush fixtures and flow fixtures. For each section, designate the fixtures in the project design that use potable water volumes using the pulldown menus. If the fixture is not listed in the pulldown menu, select "Other" from the menu. For unneeded columns, select "--" from the pulldown menu. Estimate frequency of use for male and female building occupants for each fixture used and the water savings resulting from applying auto controls (if applicable).
2. If the project uses a graywater or stormwater reuse system that is applicable to the fixtures in the Table, input the annual water volume provided by this system. The Table automatically calculates the total annual potable water volume used in the building.
3. Repeat the above procedures in the Baseline Case Table. Select conventional building fixtures from the pulldown menus. See the Reference Guide for conventional fixtures to use in the baseline case. Do not change the number of building occupants, the number of workdays, or the frequency data. Do not include graywater or rainwater harvest volumes.
4. Compare the amount of reduction to the LEED requirements listed above for each credit to determine if the project qualifies for this credit.

leedwaterAEC1.xls

WE Credit 3: Water Use Reduction**Design Case Table**

Flush Fixture	Daily Uses	Flowrate [GPF]	Duration [flush]	Auto Controls N/A	Occupants	Water Use [gal]
Ultra Low-Flow Water Closet						
Male	1	0.8	1	—	225	180
Female	5	0.8	1	—	225	900
Composting Toilet						
Male		0.0		—	0	0
Female		0.0		—	0	0
Waterless Urinal						
Male	4	0.0	1	—	225	0
Female		0.0		—	0	0
-						
Male		0.0		—	0	0
Female		0.0		—	0	0
Flow Fixture	Daily Uses	Flowrate [GPM]	Duration [sec]	Auto Controls [% savings]	Occupants	Water Use [gal]
Low-Flow Lavatory	5	1.8	20		450	1,350
Kitchen Sink	1	2.5	7200		1	300
Low-Flow Shower	1	1.8	300		40	360
Janitor Sink	1	2.5	600		1	25
-		0.0			0	0
-		0.0			0	0
-		0.0			0	0
-		0.0			0	0
Total Daily Volume [gal]						3,115
Annual Work Days						250
Annual Volume [gal]						778,750
Annual Graywater or Stormwater Reuse [gal]						
TOTAL ANNUAL VOLUME [gal]						778,750

leedwaterAEC1.xls

WE Credit 3: Water Use Reduction**Baseline Case Table**

Flush Fixture	Daily Uses	Flowrate [GPF]	Duration [flush]	Auto Controls N/A	Occupants	Water Use [gal]
Conventional Water Closet						
Male	1	1.6	1	—	225	360
Female	5	1.6	1	—	225	1,800
Conventional Urinal						
Male	4	1.0	1	—	225	900
Female	0	1.0		—	0	0
-						
Male		0.0		—	0	0
Female		0.0		—	0	0
-						
Male		0.0		—	0	0
Female		0.0		—	0	0
Flow Fixture	Daily Uses	Flowrate [GPM]	Duration [sec]	Auto Controls N/A	Occupants	Water Use [gal]
Conventional Lavatory	5	2.5	20	—	450	1,875
Kitchen Sink	1	2.5	7200	—	1	300
Shower	1	2.5	300	—	40	500
Janitor Sink	1	2.5	600	—	1	25
Other		0.0		—	0	0
-		0.0		—	0	0
-		0.0		—	0	0
-		0.0		—	0	0
Total Daily Volume [gal]						5,760
Annual Work Days						250
TOTAL ANNUAL VOLUME [gal]						1,440,000

Water Use Reduction**46%**

leedwaterAEC1.xls

WE Credit 3: Water Use Reduction**Flush Fixture Chart**

Flush Fixture Type	Water Use [GPF]
Conventional Water Closet	1.6
Low-Flow Water Closet	1.2
Ultra Low-Flow Water Closet	0.8
Composting Toilet	0.0
Conventional Urinal	1.0
Waterless Urinal	0.0
Other	
-	

Flow Fixture Chart

Flow Fixture Type	Water Use [GPM]
Conventional Lavatory	2.5
Low-Flow Lavatory	1.8
Kitchen Sink	2.5
Low-Flow Kitchen Sink	1.8
Shower	2.5
Low-Flow Shower	1.8
Janitor Sink	2.5
Hand Wash Fountain	0.5
Other	
-	

Appendix C: EnergyPlus Run Summaries

The EnergyPlus energy simulations were performed to ascertain the A/E firm's claim of 12 points in SPiRiT Credit 3.C1.1 "Optimize Energy Performance" with a 30% reduction in energy consumption. (It was unclear from the LEED™ Checklist how many points the A/E firm claimed with respect to LEED™ Credits 1.1-1.5.) In order to create a benchmark from which to measure the reduction in energy consumption, a base model was constructed according to the criteria specified in Appendix G to the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) draft Standard 90.1-2001 "Performance Rating Method," which served as the guidance for this analysis and was also in compliance with UFC 3-400-1 (adopted 28 October 2002). These standard modeling guidelines were created to evaluate buildings that are more efficient than the standards of ASHRAE Standard 90.1. As the AEC HQ building is to be a platinum-level showcase, it should be better than the standards for energy consumption by a great extent.

Establishing the baseline building and modeling it per ASHRAE guidance will establish the energy cost budget. A 95,500 sq ft building is assumed to have VAV (variable air volume) reheat, chilled water, and either a fossil fueled boiler or purchased heat. Ideally, an analysis should evaluate all types of fuel sources for comparison purposes before a specific system is selected. However, these credits in LEED and SPiRiT are based on energy cost, and not on energy use.

EnergyPlus was chosen to perform the simulation because it is the DOE standard for such analyses. The ASHRAE Standard 90.1, section G2.1.1 requires that the simulation software be able to model "8,760 hours per year; hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat set points, and HVAC [heating, ventilation, and air-conditioning] system operation, defined separately for each day of the week and holidays; thermal mass effects; 10 or more thermal zones; capacity and efficiency correction curves for mechanical heating and cooling equipment; air-side economizers with integrated control; [and] baseline building design characteristics specified in [section] G4."

The baseline model was created based on the architectural drawings included in the DD Form 1391 supporting documentation with the footprint, orientation, and heights taken directly from the drawings. The construction assemblies were chosen based on the requirements of ASHRAE Standard 90.1 Appendix G, including a

built-up roof with a reflectivity of 0.30, steel stud walls with R2.5, concrete slab-on-grade flooring, and windows that equal 40% of the total exterior wall surface. All U-values and R-values meet the requirements of ASHRAE Standard 90.1.

Lighting loads were quoted from ASHRAE Standard 90.1 table 9.3.1.1 as being 1.3 W/sq ft. The cooling loads caused by people were based on 112 people in each of the 4 office wings (2 floors in each office wing, approximately 450 people total) performing light office work and generating 0.45 kBtu/hr. Both the people and lights were scheduled to be active between the hours of 7am and 5pm.

After the baseline simulation was completed, modifications were made to the model to analyze its performance. Several different wall constructions were modeled, including 8" concrete masonry units and wood framing (Figure C1). Of the five different simulations, the most effective building envelope was the R19 6" stud wall with face brick, resulting in an estimated 13% reduction in energy consumption compared to the base model. Different windows and configurations were also tested (Figure C2). The simulation involving triple pane low-E windows performed the best, reducing energy consumption by 8% and maximizing daylight, compared to the base model and the other simulations. One of the energy optimizations mentioned in the DD Form 1391 that could not be tested was the ground source heat pumps. This is due to the fact that EnergyPlus does not yet have a template for creating this type of HVAC system. In all probability, this type of template will be available when the energy consumption modeling is performed during the design phases of this project.

Another aspect that was explored was the scheduling of the HVAC system (Figure C3). In the first simulation, the building was maintained between 68 – 78 °F for 24 hours a day. In the second simulation, the building was maintained between 68 – 78 °F only from 7am to 5pm; the set point range was increased to 60 – 86 °F from 5 pm to 7 am. In the final simulation, the HVAC was completely shut off at night (i.e., from 5 pm to 7 am), while keeping the building conditioned between 68 – 78 F during the day (i.e., 7 am to 5 pm).

In the final “optimized” model, the R19 6" stud wall with face brick was used. Triple pane low-E windows were selected, as was the EPDM roofing system discussed in the DD Form 1391 supporting documentation. A setback schedule was employed with the HVAC system to achieve even greater reductions in the energy consumption. Compared with the base model, the reduction in energy consumption of the final optimized model was over 50% [Figure C4]. However, these results should not be taken as the final substantiation to claim LEED and SPiRiT points. As a conservative assessment, CERL has estimated the potential for a 40% reduction in energy consumption. (See the LEED and SPiRiT checklists in Chapter 3). Although

improvements over the baseline case have been achieved, other more innovative energy saving concepts need to be explored. CERL recommends redesigning the building with more attention given to site orientation, daylighting, and natural ventilation aspects.

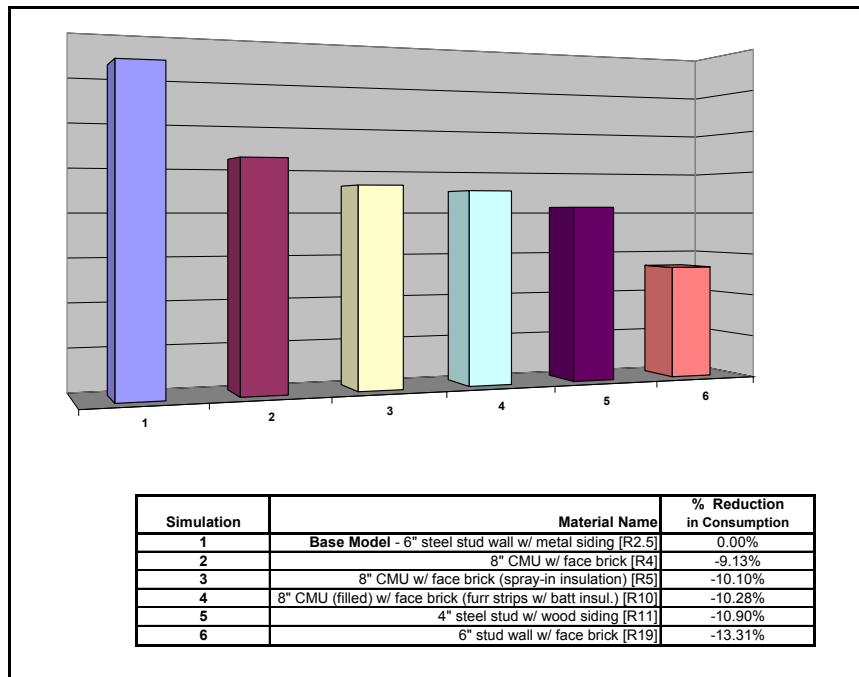


Figure C1. Comparison of annual HVAC loads—envelope construction.

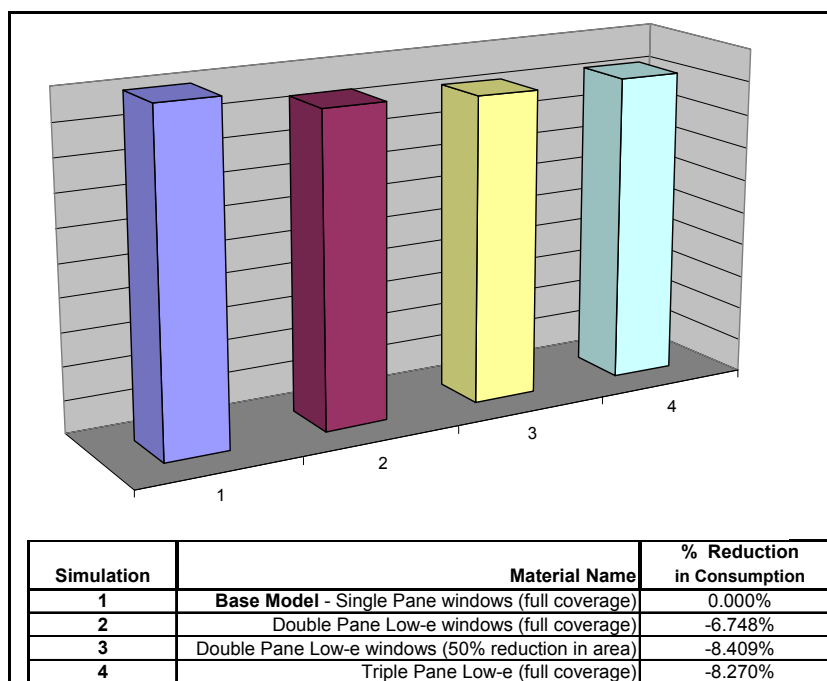


Figure C2. Comparison of annual HVAC loads—window construction.

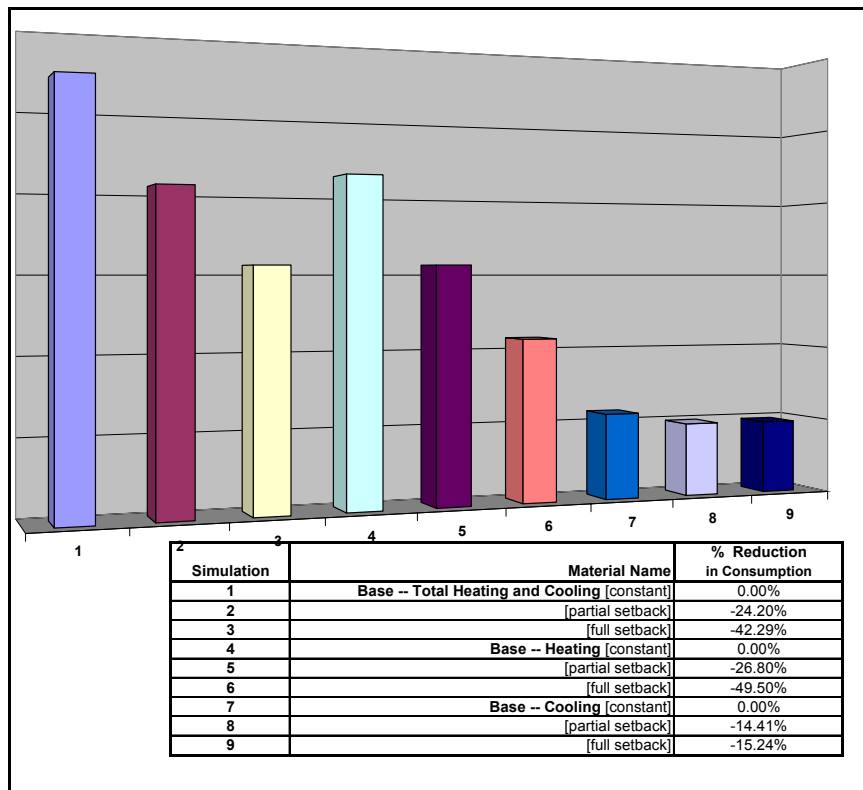


Figure C3. Comparison of annual HVAC loads—control setback comparison.

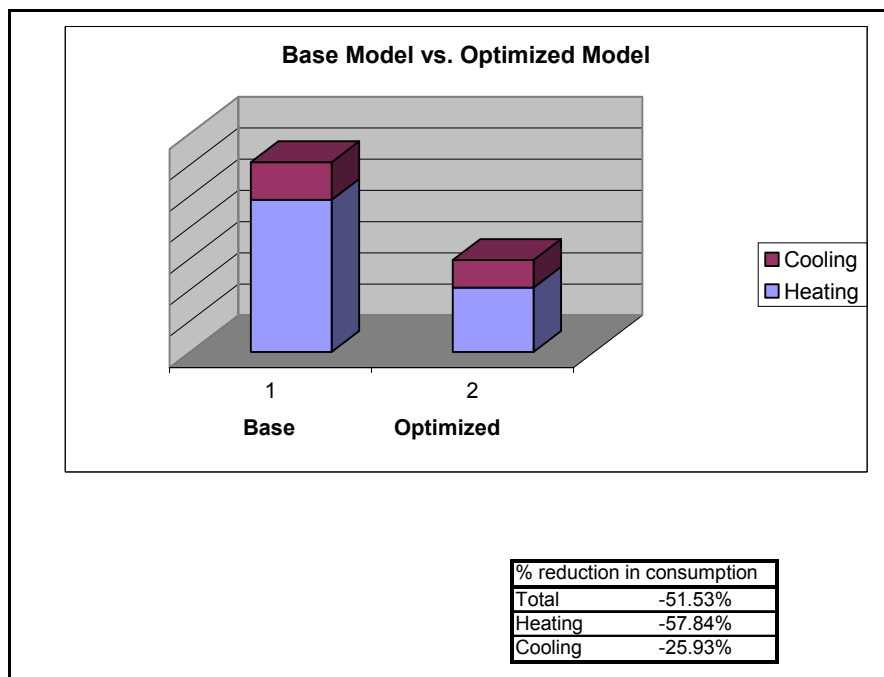


Figure C4. Base model vs. optimized model.

Appendix D: Fuel Cell Cost Analysis

Introduction

This Appendix includes a cost analysis of the proposed use of Phosphoric Acid Fuel Cells (PAFCs) for the proposed USAEC Headquarters and Administration Buildings. Fuel cells are electrochemical devices, and subsequently can produce power more efficiently than combustion-based power sources such as diesel generators and coal-fired plants. Fuel cells are also more environmentally friendly, with water being the only by product when hydrogen is used as the fuel. When fossil fuels such as natural gas or propane are used as the fuel, fuel cells still have almost undetectable emissions of sulfur and nitrogen oxides, and due to their higher efficiencies, only emit about half the amount of CO₂ as a combustion-based device.

Phosphoric Acid Fuel Cells (PAFCs) have been commercially available since 1991. The UTC Fuel Cells PC25C PAFC has an electrical output of 200 kW, and an available thermal output (hot water) of 900,000 BTUs/hour. The input fuel is natural gas. The entire PC25 fleet has logged almost 6 million hours of operation to date. These units can achieve an overall efficiency of 85% or greater when the waste heat is utilized for cogeneration. The PC25C is a very reliable power source and has demonstrated availabilities greater than 95% when properly maintained.

The main obstacle to the widespread implementation of PAFCs is cost. The current purchase price for a PC25C is \$850,000. The average cost for installing one of these units is approximately \$100,000. The Department of Defense has administered a fuel cell “Grant” or “Rebate” program for the last several years. This program offers a subsidy of \$1,000/kW for the purchase and installation of fuel cells. For a 200 kW PAFC, this would be a rebate of \$200,000, bringing the installed cost of the unit to \$750,000. Average annual maintenance costs are approximately \$18,000. Fuel cell “stack” replacements will be required during the 6th, 12th, and 18th years. These stack replacements are estimated to cost \$100,000–\$150,000 in the next 5 years (current stack replacement costs are \$300,000/stack).

Summary

Simple net savings (without annual maintenance costs and without amortization of the initial capital investment) were calculated based on three scenarios of fuel cell waste heat utilization (Cases 1-3, 30%, 70%, and 100% waste heat utilization respectively). The detailed calculations are presented in Appendix A. The results are summarized in Table D1.

Table D1. Net savings based on fuel cell thermal utilization.

Case	Electric Savings	Thermal Savings	NG Usage	Simple Net Savings
1	\$116,000	\$24,000	\$142,000	(\$2,000)
2	\$116,000	\$56,000	\$142,000	\$30,000
3	\$116,000	\$79,000	\$142,000	\$53,000

Calculations were also performed to determine the Total Life Cost of the project (neglecting discount factors and inflation) based on a 20-year life of the fuel cell. The detailed calculations are discussed in Appendix A. The results are summarized in Table D2.

Table D2. Total life cost of fuel cell installation.

Savings from Fuel Cell	\$1,060,000
Installed Cost of Unit	\$750,000
Cost of Maintenance	\$360,000
Cost of Stack Replacements	\$300,000
Total	\$1,410,000
Total Life Cost for Project	-\$350,000

Conclusions

The large negative value (-\$350,000) of the project for the 20-year expected life indicates that it is not cost effective to do this project. Some of the assumptions made in the calculations to arrive at this figure were very optimistic (such as the receipt of a \$200,000 grant for the fuel cell, the \$100,000 cost for replacement stacks, a thermal utilization of 100%, etc.). The high cost of natural gas (\$9.50/mmBtu) is a significant driver in the economic calculations. Additional electric savings would also be realized if a demand (\$/kW) charge could be offset. Since the proposed building is a “tenant” organization, the rate they pay for energy (\$0.075/kWh) has a demand component built in. However, the base as a whole will benefit from the use of the fuel cell to offset 200 kW of the base’s peak demand. This scenario has appeared on several occasions with earlier installations of fuel cells at such entities as Naval Hospitals on Marine Corps Bases. Regardless, the tenant organization has their

own set utility rates from which to work with, and in this case the fuel cell project is not economically feasible for the proposed building.

Fuel Cell Calculations

Bldg Heat Load Estimate

From CERL Tech. Report E-186, heating usage in an Army Admin/Training building can be approximated as:

$$\text{HeatLoad} = (75.7 + 18.9 \times \text{HDDd}) \text{ Btu/sq ft/day}$$

$$\text{HDDd} = \text{HDD} \div 365 \text{ days/year}$$

Using an annual heating degree days (HDD) value of 4707 (taken from NOAA web site for Baltimore, MD) and using sq ft = 95,000

$$\text{HeatLoad} = 11,076 \text{ mmBtu per year}$$

Fuel Cell Heat Available during heat season

Heating season will be assumed as 7 months (or 7/12) of the year.

$$\text{FCheat} = (\text{FC heat capacity}) \times (\text{availability}) \times (\text{hrs/year})$$

$$= 900,000 \times 0.9 \times 8760 \times 7/12$$

$$= 4,139 \text{ mmBtu}$$

Utilization of FC heat

If all available fuel cell heat is used for 7 months per year,

$$\text{Util.} = 4,139 / 11,076 = 37\%$$

Electricity Savings

At \$0.075 per kwh, the 200kW fuel cell will displace grid electricity as shown.

$$\text{Elec. Savings} = (8,760 \text{ hr/yr}) \times (.9) \times (200 \text{ kW}) \times (\$0.075/\text{kWh})$$

$$= \$116,000.$$

Natural Gas Consumption by Fuel Cell

At \$9.50 per mmBtu for NG and a FC operating at 36% electrical efficiency,

$$\begin{aligned}\text{NGusage} &= (8,760) \times (.9) \times (200) / (.36) \times (3,413 \text{ Btu/kWh}) \times \$9.50 / 106 \\ &= \$142,000\end{aligned}$$

Savings from Utilization of FC heat

The previously calculated heat utilization value (37%) was based on assumptions of only using heat for 7 months and heat estimating equations from old field studies. Therefore, potential savings from FC heat utilization will be considered at several additional levels of utilization. It is conceivable that better levels of utilization might be possible for a fuel cell designed into a modern building.

$$\text{ThermalSavings} = (\text{Util}) \times (\text{FC heat capacity}) / (\text{boiler efficiency}) \times \$9.50$$

$$\text{ThermalSavings}(30\%) = (.3) \times (7096) / (.85) \times \$9.50$$

$$= \$24,000$$

$$\text{ThermalSavings}(70\%) = (.7) \times (7096) / (.85) \times \$9.50$$

$$= \$56,000$$

$$\text{ThermalSavings}(100\%) = (1) \times (7096) / (.85) \times \$9.50$$

$$= \$79,000$$

The 7096 value refers to the amount of heat that the fuel cell can put out for the year, based on a 90% availability. The total amount of heat the fuel cell can put out is 900,000 Btu/hour * 8760 hours/year = 7,884 mmBtu. If you multiply this number by 0.90 (the 90% estimated availability of the fuel cell) you get the 7096 mmBtu (million Btus).

So now that you have the total amount of heat that the fuel cell puts out with a 90% availability rate, you can multiply this by the expected utilization (30%, 70%, 100%) that your load can actually use (if you are dumping more heat into something that cannot accept it, you are not getting the benefit of the extra heat). You then determine the fuel that your boiler does not have to use because you are supplying it with fuel cell heat and this is where the boiler efficiency comes in. The more inefficient your boiler is, the more fuel your boiler uses to produce the same amount of heat. Therefore, when you give the boiler “free” heat from the fuel cell, it does not need to turn on and burn as much fuel. This boiler fuel savings is what we are calculating as the thermal benefit from the fuel cell. Since this is going to be a new building, the boiler efficiency will probably be pretty high. We used 85% which might even be a tad bit low.

Simple Net Savings

Simple net savings (without annual maintenance costs and without amortization of the initial capital investment) can be calculated as:

$$\text{SimpleNetSavings} = (\text{ElecSavings}) + (\text{ThermalSavings}) - (\text{NGUsage})$$

Simple net savings for several levels of thermal savings are shown in the Table D3.

Table D3. Net savings for several levels of thermal savings.

Electric Savings	Thermal Savings	NG Usage	Simple Net Savings
\$116,000	\$24,000	\$142,000	(\$2,000)
\$116,000	\$56,000	\$142,000	\$30,000
\$116,000	\$79,000	\$142,000	\$53,000

Fuel Cell Installed Costs

Purchase price of a 200 kW fuel cell is assumed to be \$800,000. Installation costs are assumed to be \$100,000. If the project can obtain a \$200,000 rebate from the DoD Climate Change program, the price for the installed fuel cell is:

$$\begin{aligned} \text{InstalFCcost} &= \$850\text{K} + \$100\text{K} - \$200\text{K} \\ &= \$750,000 \end{aligned}$$

Fuel Cell Annual Maintenance

The fuel cell requires routine annual maintenance, which is estimated at \$18,000 per year (based on experience).

Fuel Cell Periodic Maintenance and Repair (M&R)

It is anticipated (based on a 40,000 hour expected life) that the fuel cell stack will need replacement in or about the 6th, 12th, and 18th year. Typical (but optimistic, in my opinion) estimates for cell stack replacement range from \$100K to \$150K.

Additionally, experience has shown that other unpredictable M&R may occasionally be needed but are difficult to estimate.

Preview of Life Cycle Cost (LCC) Expectations

Life cycle cost evaluations will discount the value of future years' savings used to offset today's initial capital costs based on the time value of money. However, a

simple look (momentarily ignoring the out-year discounting and out-year M&R) can provide a quick indication of LCC expectations.

An initial capital cost of \$750K divided into 20 years of life requires \$37,500 per year savings (and discounting will raise that number higher.) Additionally, routine maintenance was estimated at \$18K. So, more than \$55K (35 + 18) annual savings will be needed in the LCC if the project is going to show a positive net savings. From the simple savings estimate above, \$53K was the savings amount for the case when 100% of the fuel cell heat could be utilized. That simple payback of \$53K does not include the out-year costs (stack replacement and unpredicted M&R), which will further lower LCC net savings.

From this preview, it is obvious that LCC analysis will yield a negative net savings (even if a discount rate of zero percent is selected. Higher discount rates will yield more negative net savings.)

Appendix E: Revised DD Form 1391 Guide for NAD USACE Certification



DEPARTMENT OF THE ARMY
NORTH ATLANTIC DIVISION, CORP OF ENGINEERS
FORT HAMILTON MILITARY COMMUNITY
GENERAL LEE AVENUE
BROOKLYN, NY 11252-6700

IN REPLY REFER TO

CENAD-ET-E

MEMORANDUM FOR MACOM Master Planners
Installation Master Planners

SUBJECT: Revised DD Form 1391 Guide for NAD USACE Certification

1. Reference CEMP-ES memorandum dated 28 February 1991, subject: Review of DD Forms 1391.
2. Referenced memorandum authorized USACE MSC Commanders to review and certify scope, cost and sufficiency of information to start design on DD Forms 1391. In order to expedite the certification process, this guide has been prepared.
3. This revision adds new information, and up-dates the format to the new Tab system.
4. The guidance provided represents the information the NAD 1391 review team and MCX reviewers are looking for in your submitted 1391 forms. It follows, Tab-by-Tab, as it appears in the processor, and indicates the specific information that should be entered. The intention is that, if followed, there will be no comments and subsequent corrections on your 1391s, a process that can delay certification and project approval.
5. POC at this office is Barry Saltsberg, tel. (718) 491-8744; e-mail barry.s.saltsberg@usace.army.mil.

US ARMY CORPS OF ENGINEERS
NORTH ATLANTIC DIVISION

DD FORM 1391
GUIDE FOR USACE CERTIFICATION

TAB A – DD Form 1391

1. HEADER INFORMATION

- a. Have you shown the correct fiscal year (FY)?
- b. Are the construction start and end dates correct in accordance with the FY?
- c. Is the location of the Installation / sub-Installation correct?
- d. Is Category code IAW AR 415-28 ?
- e. Does the project title accurately describe the project?
- f. Have you shown the correct type of construction (New Construction, Mod, etc.)?
- g. Is project number (Form Number) correct?

2. COST DATA

a. EUROPE-SPECIFIC - Is the correct exchange rate used? Exchange rate changes every year. OSD publishes PBG 660 approximately 18 Dec, and the exchange rates are stated at USAREUR's January or February MCA review board. Recommend the DD1391 Processor do the automatic update on project costs.

b. ALL PROJECTS - Assure that costs are broken down into line items, and presented in terms of quantities and unit costs, in order to sufficiently and accurately describe the project. Special equipment or features of construction, bought with OMA or OPA funds (not MCA funds) such as emergency generator/ uninterruptible power supply, UMCS or intrusion detection system should only show the cost of installation in the estimate. Show the cost of purchase in Tab E. Building information systems, AT/FP (cross referenced to Tab G), asbestos abatement and lead paint abatement (separately, and only in conjunction to total building demolition, not when it is part of an alteration)) should be broken out of the estimate and shown as separate line items in the detailed estimate. Make sure applicable items, such as information systems and EMCS have appropriate components under both primary and supporting facilities.

c. Cost of IDS should be listed separately from other items of electronic security. Each should be shown as line items in either the primary or supporting facilities, as appropriate.

d. Seismic upgrade, if required, should appear as a separate line item.

e. Demolition should be included under site demolition in supporting facilities. Also, include non-site demolition if facilities to be torn down directly support the mission relocating into the new facilities, or if they are being demolished to balance new construction. (Coordinate with Tab H)

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- f. All facilities should be shown as unit costs, where feasible, IAW AR 415-28.
- g. HQ USACE cost guidance should be used (See newsletter 3.2.2, published annually at <http://www.hq.usace.army.mil/cemp/e/es/pax/paxtoc.htm>). Costs will differ IAW local area, size adjustment and inflation factors.
- h. Support Facilities should not exceed 25% of primary facilities for Military Construction, Army (MCA) or 30%-35% for Army Family Housing (AFH). If they do, a short statement in the Description of Construction should be provided to explain.
- i. Ensure that contingency and SIOH are the correct current percentages IAW ER 1110-3-1300, Military Programs Cost Engineering
- j. Check the Detail Estimate & Description of Construction against each other and with standard design, where applicable. Describe the project, and ensure every item has a corresponding line item in the cost estimate. If the vehicle maintenance shop has an IDS, buy it in Tab E, install it in the Description of Construction and pay for installation in the Estimate.
- k. The 1391 should explicitly describe high costs caused by local conditions, change in unit costs or special features. For example: Tab A, Additional, is a good place to describe how the incised topography around Baumholder, Germany, requires deep foundations, which increase the cost such-and-such an amount, as shown in Estimate and described in the Description of Construction.

3. FRONT PAGE TEXT

- a. Description of Proposed Construction - Begin the description with a verb, such as "Construct"/"Renovate"/"Modernize," etc. For example, "Construct a standard design Child Development Center."
- b. State whether the proposed facility is a standard design and make sure the scope is correct for the authorized strength, i.e., number of soldiers for a barracks complex; number of dependent children for a child development center, etc..
- c. Do not discuss longevity of construction (permanent, semi-permanent, temporary). The paragraph should not contain design or construction details (e.g., steel frame, reinforced concrete, R-30 Insulation) except when a finish or style is necessary to blend with, or match the surrounding buildings. In that case, it should be stated, and the reason given. For example, if it is in an historic district. Other than that, discuss what, not why.

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- d. Do not use negative statements (Handicapped will not be provided for.). State handicapped requirements only if they are required. Army Family Housing (AFH) projects should have a statement that "5% of quarters will be accessible or easily modifiable to accommodate handicapped requirements."
- e. Outline all primary and support facilities.
- f. Seismic upgrade - AR 415-15 and AR 420-70 specify situations that would trigger the need for seismic evaluation. If evaluation indicates that resistance of the structure does not meet established criteria, structural rehabilitation must be part of the project. Guidance and acceptance criteria for evaluation and upgrading or strengthening of existing buildings are given in TI 809-05, Seismic Evaluation and rehabilitation for buildings. 1391 must describe the scope of seismic upgrade, when applicable. An estimate of the cost of the seismic upgrade must be developed and shown as a separate line item in the Estimate. NOTE – As of this writing, the method of determining the need for seismic evaluation is undergoing review, and more "user friendly" criteria will be forthcoming. Until that criteria is provided, contact Steven Sweeney, CEERD-CF-M, (voice) 217-373-6793 or (e-mail) Steven.C.Sweeney@usace.army.mil. Mr. Sweeney will help you evaluate the need and any necessary seismic upgrade required.
- g. State when "Project requires comprehensive interior design."
- h. Note Asbestos removal and/or Lead Paint Abatement if they occur in a building to be demolished as part of the project, and cost it in the Estimate under Supporting Facilities.
- i. MCA Projects - Indicate type of heating & cooling, whether new, existing or self-contained, and note tonnage of A/C.
- j. AFH Projects – Description of Construction should contain the number of units, grade of occupant, type of unit (Wherry, Capehart), when constructed and how many of what kind of unit (2BR, 3BR).
- k. Requirement - Show continuing need. State the requirement for the project and why the project is being built. Use positive statements only. Standard Statements that must be included for specific projects:
- Training Projects - state average daily loads.
 - Barracks - what is maximum and intended utilization.
- l. Additional
- a. Provide date of Tempest Risk Assessment, which is needed if storage, handling or use of classified information is required in a facility.

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b. State requirement for Department of Defense Explosives Safety Board (DDESB) approval and date of approval for projects involving ammunition storage facilities or projects near such facilities.

c. State requirement for FAA approval and date of approval for projects on or involving airfields.

TAB B– Planning and Design Data (and USACE Certification)

For USACE use...do not fill in

TAB C – Miscellaneous Support Data

This Tab is the responsibility of the MACOM or the Installation Management Agency (IMA); however, the following guidance should be of use in their preparation:

1. Quantitative Data

Be sure to enter the correct data based on the Army Criteria Tracking System (ACTS), the Real Property Master Plan (RPMP) and the Installation Real Property Planning and Analysis System (RPLANS). This information is automatically transferred to “Line 11.” Under Requirement, do not enter “none.” Remember...if there is no requirement, there is no project.

2. General Justification Data

a. General – Describe the mission and justify its need. However, do not embellish it with long-winded prose. Your target audience are busy people who do not have time to read your version of War and Peace. KISS applies...keep it short and simple.

b. Traffic Analysis – Choose the appropriate standard statement, and if there will be impacts, coordinate with Military Traffic Management Command (MTMC) and provide date of MTMC survey.

c. Analysis of Deficiencies – This section refers to the “Existing Inadequate” under Quantitative Data. Describe the deficiencies and cite how they limit performance or hinder mission accomplishment. Remember: KISS.

d. Criteria for Proposed Construction - This section should be a listing of regulations and applicable criteria.

(1) Applicable regulations for all projects include:

- TI 800-01, Design Criteria
- UFAS, Uniform Federal Accessibility Standards and ADA Standards for Accessible Design
- NFPA 101, Life Safety Code
- Standard design as applicable to the specific project
- Installation Design Guide for the project location
- Additional criteria as applicable to the specific project

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(2) For family housing – TI 801-02 - Family Housing

(3) EUROPE-SPECIFIC – Reference applicable US standards. In Germany, Host Nation standards are the primary source of guidance for the State Construction Authority (SBA), the German agency that contracts for design and construction. Therefore, reference to US standards help the SBA look for and use them. Especially for fire protection and prevention and for access for the handicapped, refer to the US standards NFPA and TI. Refer to applicable standard designs by name, number and source. Refer to the local Installation Design Guide or Housing Community Plan.

3. MACOM / IMA Certification – to be signed After USACE certification.

TAB D - Economic Analysis

Approval of this section is by the Chief Economist at HQUSACE, who provides the following guidance:

1. An EA is required for all projects. There are different levels / depths of EA's.

(a) A full EA. This is when all alternatives are defined, and there is more than one viable alternative. The Life Cycle Cost (LCC) section is completed.

(b) An EA where once all the alternatives are discussed, it is determined that based on NON MONETARY reasons that only one viable alternative exists. [This does not mean that you use the statement, "it is cost prohibitive" as a reason for claiming the alternative as not being viable. If you use this statement, the EA will be sent back to you to support your findings by preparing an LCC.]

(c) An EA where the project is mandated by law. For example, Chem Demil projects fall into this category.

2. The one thing that ALL of the above have in common is that they all MUST have a Project Objective written. Why? Because the EA is a stand-alone document. It is read apart from TAB A and the remainder of the 1391. This means that if you don't explain what the requirements / criteria are for the project, your statements that follow make no sense to anyone reading it. Obviously this is not good.

3. A project objective is an unbiased statement describing the inadequacy to be corrected. This means you DO NOT start a project objective with "To Construct". This is inferring that you have already made the decision to construct. Not good.

4. Start the statement with "To provide..." State size and quantity when possible. DO NOT use "adequate barracks" you are bringing barracks up to DA standards. Stay away from subjective adjective in this statement. Stick with the facts. New mission of... compliance with Public Law., you get the idea. If you need a 16,000 sq ft facility for whatever reason, if it needs to be one contiguous building, state so. State your criteria.

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5. ALTERNATIVES:

Some of you are making this harder on yourselves; some of you are way too broad, and it shows. I understand both positions, but let's try and make less work for everyone. Remember that, although innovation is being sought, be realistic. We still have laws we have to live by.

a. STATUS QUO: Describe the condition of facility right now. Explain why the current situation won't work. Don't quantify the conditions; just describe the actual conditions. End with "This is not a viable alternative." After all, if status quo is viable, why have a project?

One exception is if you are working on a primary EA. This is when the current condition works perfectly well, however, if you use an alternative, it would cost less in the long run.

b. RENOVATE: Describe what renovation will provide. Is renovation possible? If not, describe why not. End with if this alternative is or is not viable.

c. RENOVATE / NEW CONSTRUCTION MIX: Describe what this alternative will provide. Is renovation / new construction possible? If not, describe why not. End with if this alternative is viable or not viable.

d. NEW CONSTRUCTION: Describe what new construction will provide. Is new construction possible? If not, describe why not. End with if this alternative is viable or not viable.

e. LEASE: A word of caution with leasing. Make sure that if you use this as a viable alternative, that facilities are truly available. Are there really 200 units available to rent for a barracks project that meets the DA standard?

f. OTHER FACILITIES ON POST / BASE / CAMP: You get the idea by now.

g. JOINT USE OF OTHER INSTALLATIONS:

h. OTHER FACILITIES ON NEARBY INSTALLATIONS:

These are the general alternatives used. Describe what the alternative will provide or why it won't work, and end with either it is or is not a viable alternative.

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6. If at this point you have only one viable alternative, the only thing left is to recap that the recommendation is the one viable alternative, which fully meets the project objective. Keep in mind that an alternative **MUST** meet the project objective, not come close to it.

If there is more than one viable alternative you are on your way to completing a full EA.

Check the current discount rate per OMP A-94, Appendix C, Feb 2002, 5.8%.

7. NON-MONETARY COSTS & BENEFITS:

This is the section where you get to sell your project. What makes it so special that this project should be approved before the others? And remember - the others are not only within the MACOM and DA but Air Force and Navy as well. If we have been cited as being not in compliance with specific regulations or laws, cite what those infractions are. Make the discussion strong, but not offensive.

8. ASSUMPTIONS:

List all the assumptions that you are making about the viable alternatives. This is specific to your project and location. Sorry, no canned statements. Well, maybe a few: number of years of the analysis; number of years lead time; type of major renovation work to be performed and when (HVAC, roof, etc.); no salvage values on all alternatives. These are just a few of the items you can have under the assumptions. Keep in mind that your assumptions do tie together with the LCC and Source and Derivation sections to make a complete detailed package of your analysis process. Your train of thought, as it were.

9. LIFE CYCLE COSTS:

Some usual costs listed besides the obvious of the alternative being analyzed:

- a. Utilities: Define under assumption what this is specifically to include.
- b. Maintenance & Repair
- c. Salvation: The value of the facility (if any) at the end of the analysis period.
- d. Transportation: If appropriate for the alternative.
- e. Major Repairs: Used to single out future major repairs such as roof replacement, HVAC, flooring, etc. These costs are placed in the year of expected occurrence. Define what the items are under assumptions. Another way of accounting for these expenses is to add the additional costs to the column for M&R. Again, specify under assumptions what the jump in M&R is caused by.
- f. Imputed Costs. These are **ONLY** used when LEASING is a viable alternative. And then Imputed Costs are used for **ALL** other alternatives.
- g. Imputed Taxes
- h. Imputed Insurance

10. SOURCES & DERIVATIONS:

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For each of the alternatives analyzed, list where and when each cost element was obtained. Show the calculations used to derive the figures used in the LCC. This is your audit trail. When asked several years (or weeks, or months) from now where you got these figures, you may not remember, or you may not even be in that job any longer. Also, as you all know, you may be preparing a document for FY05, but it may not get approved. It may show up in the program 3, 5, or 7 years from now. When you date your source of data, you will know that you have to update that information. If you don't, you will be asked to verify that you (or the person who is working there) have done so.

11. RECOMMENDATION:

This is the summary of all your hard work. It's for the folks who like to see the bottom line first. Summarize why besides being the lowest NPV, the alternative of XXX is the best alternative. Summarize the info from Non-monetary costs and benefits and the data from the Sensitivity Analysis.

12. OTHER:

Something that you may want to get used to doing is placing YOUR name and commercial telephone number on the "Prepared by" line. Why? Two reasons. One, the form is being changed to where, if these two items are not filled in, the form won't advance, and the second is that your EA is being reviewed in Washington, D.C. Most of you are not on the USACE e-mail list and there would be no way to quickly get in contact with you if there is a question or comment. The faster you can be contacted, the more time you have to correct your EA.

If you have any questions call Donna Smigel at 202 761-0226 or e-mail her at Donna.r.smigel@usace.army.mil

Tab E – Furnishings and Equipment

Although these are not paid for out of construction dollars, furnishings & associated equipment requirements need to be identified, and the funding source noted. Present the information in tabular form, and include discussion, as applicable, for clarification. Be sure to provide costs for all furniture and equipment, and separately, the info systems equipment. If you don't identify these costs now, there may not be any funding for them later, when needed.

Tab F – Information Systems Cost Estimate

1. This section is certified by the US Army Information Systems Engineering Command at Ft Detrich. USAISEC provides a design and implementation guide for official use by DOIMs and others involved in the planning and design of voice and data communications systems for military construction projects worldwide. This guide, called the "Information Installation Infrastructure Architecture (I3A) Design and Implementation Guide", is available on the DISC4 web site at: <http://arch-odisc4.army.mil/I3A/i3a.htm> (case

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sensitive; enter exactly as shown). ISEC-FDEO uses this guide during its review and cost estimation process to determine the adequacy of project designs submitted by architect-engineering firms and the Corps of Engineers. DOIMs are encouraged to make use of this guide during their project planning process and as a tool to assist in preparation of Tab F.

2. The ISCE for Windows application is available on the U.S. Army Corps of Engineers Huntsville web site at: <http://www.hnd.usace.army.mil/paxspt/>

3. ISEC-FDEO certification of Tab F is accomplished as follows:

a. Determine footprint and structure of project building(s) in gross square feet area. The ISCE for Windows cost model estimates costs in part based on total area and distribution of that area over multiple floors within the project building.

b. Differentiate areas within the project building(s) by usage and determine size of each in gross square feet. The ISCE for Windows cost model estimates costs in part based on intended usage of the various areas within each project building.

c. Determine user population of project building(s) in terms of voice and data requirements. The ISCE for Windows cost model estimates costs in part based on current and projected future user population within each project building.

d. Establish outside plant connectivity requirements including distance to point of connection and any special, unique or unusual project or local post requirements. During the certification process, ISEC-FDEO must assume outside plant information provided by the DOIM in section 17 represents an accurate accounting of project requirements. Only in cases where the outside plant requirements are plainly excessive or inadequate will the data be questioned.

e. Run the ISCE for Windows application entering data as required to provide a baseline cost estimate, manually modifying the cost estimator's assumptions (if necessary) to accommodate special, unique or unusual project or local post requirements.

f. Compare the ISCE for Windows cost estimate to the Section 17 cost estimate in terms of total dollar value. Direct comparison of line item descriptions and quantities is of secondary importance during the certification process, and should be avoided. Line item descriptions and

Tab G – Antiterrorism / Force Protection

1. There are three possible "standard text" statements. Choose the one that applies to your project. In abbreviated form, they are:

(a) Only minimum AT/FP standards apply.

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- (b) Both minimum standards and above minimum measures are required.
 - (c) AT/FP construction standards do not apply to this project.
2. If the applicable statement is either (1) or (2), a second paragraph is required that should include a summary of the risk and threat analysis results and a detailed description of what construction features are required to mitigate those threats. An estimate of the cost of those measures must be provided for both the Primary and Supporting Facilities in the Estimate of Construction on the front page.
 3. Include information on the type of building or area, arms room or other areas to be secured by IDS or other type of electronic security or surveillance equipment.
 4. Coordinate Tab G with the Description of Construction, briefly restating the features of AT/FP mitigation in the Description that are provided in Tab G.
 5. Tab G must be signed by the installation Provost Marshal, the Director of Public Works, and the installation Force Protection Officer.

Tab H – Present Accommodations and Dispositions

Assure that scope of demolition work shown here agrees with the Estimate and Description of Construction. This Tab should be presented in tabular form, with narrative explanations, if needed.

Tab J – Regulatory

1. Environmental Analysis

- a. The DD form 1391 should:
 - specify the regulations used to evaluate the impacts of the proposed project;
 - pass the AR 200-2, Appendix H definition of significant action, or state how this isn't a significant action;
 - include signature of environmental officer.
- Europe Specific -
- state how the project satisfies the applicable laws or international agreements;
 - describe environmental elements and effects of this project;
- state when and how the Host Nation interests get reviewed;

b. Summary of Environmental Documentation - This section is often lacking or is only partially completed. The facilities need to state what was done. If a categorical exclusion was used, it should be identified. Where Record of Environmental Consideration (RECs) are required, pertinent info should be included (which office prepared it & date signed). If an Environmental Assessment (EA) or Environmental Impact Statement (EIS) was prepared, again, the latest date or status of the NEPA

documentation should be provided (for example, a 1391 dated 2 / 01 should not indicate that an EA was to be prepared 3 / 96).

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c. NOTE: Reviewers and programmers often do not understand that US regulations are written so international agreements and Host Nation regulations apply. Sample of a properly written section follows:

The National Environmental Policy Act does not apply to this OCONUS installation in accordance with Appendix H, AR 200-2. However, full compliance is maintained with Host Nation laws and with negotiated agreements. In Germany, Germany's Host Nation laws and standards apply as negotiated in the German Final Governing Standards.

(This new project) will be designed and constructed for the US Forces by the State Construction Office (Staatliches Bauamt or SBA). This State-level agency regularly manages design and construction on German Federal property given over to US control, as is the case with this project. State construction offices consider applicable environmental standards during design. In addition, they coordinate every design with applicable technical and administrative Host Nation organizations.

Documents have been coordinated during preparation with the environmental personnel. None of the conditions of a significant Federal action apply. The selected site for the new project has no apparent environmental pre-conditions. According to asbestos surveys, there is no asbestos in the current building to be demolished as part of this project. There may be non-friable asbestos in the corrugated roofing on two relatively small additions to the building; it will be disposed of as negotiated in the German Final Governing Standards.

/S/
Name
Environmental Officer
DPW, 1st BSB
DSN 999-9999

d. Summary of Environmental Consequences –

(1). This is an important section which is often inadequately written. It needs to summarize existing conditions and environmental impact of the proposed work.

(2). EUROPE-SPECIFIC - Statement on DD1391 should read: "The Record of Environmental Consideration (REC) is included. It has been determined that the action: Is exempt from NEPA requirements under provisions of AR200-2." (Select standard paragraph >a; >2; then input >AR200-2.)

NOTE: REC has probably not been prepared, but the DD1391 Processor allows only a limited number of choices. This standard paragraph solution best describes the actual situation, especially when supplemented with a complete Tab J explanation of

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compliance with Appendix H, description of the project, and description of coordination with the Host Nation authorities.

2. Protection of Historic Properties

a. Protection of Historic Properties - review procedures that have been used should be stated.

EUROPE-SPECIFIC. Statement on DD Form 1391 should read: "This project has been evaluated for impact on historic and archeological property and complies with the National Historic Preservation Act (PL 89-665), as amended, and EO 11593" (unless project doesn't fit within the three AR 420-40 criteria). (Select standard paragraph >a.)

b. Detailed Statement of Review Findings - If a site survey was prepared, that information should be cited in the 1391 and briefly summarized. The views of the SHPO should also be included, and the date of the state's concurrence letter should be provided.

EUROPE-SPECIFIC.
The DD Form 1391 should describe the regulatory guidance and the criteria that apply overseas, and should state how the project fits within the criteria. Sample of a properly written section follows:

This project has been reviewed in accordance with AR 420-40, Historic Preservation, Applicability, paragraph d, which states: Outside the United States, Department of the Army activities will comply with:

- Historic preservation requirements of the host country.
- International and Status of Forces Agreements.
- Requirements for NHPA protection of properties on the World Heritage List.
- This project does not affect a property with host country historic preservation requirements. The Staatliches Hochbauamt which will design the project IAW international and Status of Forces Agreements, coordinates with state and national agencies during design. The project does not affect properties on the World Heritage List.

3. Evaluation of Flood Hazard and Encroachment on Wetlands

This section needs to clearly state whether or not the proposed facilities are located in wetlands or in low-lying areas. With regard to the potential for wetlands, there should be some indication that the correct office of the facility was involved in the review and determination of the site.

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4. Requirements for the Handicapped

Choose correct standard statement, and fill in the number of civilian (not only handicapped civilians) employees and visitors.

- In general, all facilities will be made accessible to the handicapped.
- Exceptions are where it can be demonstrated that only able-bodied military personnel will use the facility for the foreseeable future.
- In the case of barracks, sleeping areas will not be accessible, but “public” areas should be accessible.
- The other exception is where it can be demonstrated that the presence of handicapped personnel would constitute a safety hazard.

5. Energy and Utility Requirements

This is a very important paragraph, and should be a concise listing of utilities and services:

- available at the site;
- required for the proposed facility;
- ability of the existing facilities to meet the need or services required to be brought in for the proposed project (which should be coordinated with the Estimate).

Appendix F: AEC HQ/Administration Building 1391 Review

Note: Review changes are shown as underlined text. Deletions are shown as strikeout text.

ARMY	2006	59667 P	REVISION DATE: 22 NOV 2002
		MCA (AS OF 12/05/2002 AT 14:58:01)	28 OCT 2002
		LAF=.89	UM=E
Aberdeen Proving Ground Maryland		Headquarters Administrative Facility, ~~SPiRiT/LEED-P~~	
	610 50	59667	32,000
PRIMARY FACILITY			25,136
U.S. Army Environmental Center	SF	95,500	258.55 (24,692)
Building Information Systems	LS	--	-- (444)
SUPPORTING FACILITIES			2,244
Electric Service	LS	--	-- (111)
Water, Sewer, Gas	LS	--	-- (23)
Steam And/Or Chilled Water Distr	LS	--	-- (339)
Paving, Walks, Curbs And Gutters	LS	--	-- (170)
Storm Drainage	LS	--	-- (336)
Site Imp(890) Demo(1124)	LS	--	-- (890)
Information Systems	LS	--	-- (356)
Antiterrorism/Force Protection	LS	--	-- (19)
ESTIMATED CONTRACT COST			27,380
CONTINGENCY PERCENT (10.0%)(5%) (max allowed under current guidance)			
2,738			
SUBTOTAL			30,118
SUPERVISION, INSPECTION & OVERHEAD (5.70%)			1,717
TOTAL REQUEST			31,835
TOTAL REQUEST (ROUNDED)			32,000
INSTALLED EQT-OTHER APPROPRIATIONS			(102)

Construct a headquarters general purpose administrative facility for the ~~Special Project Rating Tool (SPiRiT) / Leadership in Energy and Environmental Design (LEED) Platinum rated, Army Showcase Headquarters Administration Building~~ to house the administrative functions of the U.S. Army Environmental Center (USAEC). Project includes offices, conference rooms, etc., etc., etc. and selective demolition and reuse of an existing warehouse building (70,100 square feet) that includes asbestos and lead-based paint abatement. Facility will also include showcase energy saving and environmentally sensitive technologies, systems, and components. ~~Provide building information systems.~~ Supporting facilities include electric service; water, sewer, and gas; paving, walks, curbs, and gutters; storm drainage; site improvements; information systems; and antiterrorism/force protection measures. Work includes replacing mature trees (approximately 2.5 acres) on a one-to-one basis at a designated on-base area. ~~Project includes the selective demolition of an existing warehouse building (70,100 square feet). Demolition includes asbestos and lead-based paint abatement. A portion of the existing building foundation, steel framing, and wood decking will be reused as part of the construction project.~~ Provide for the handicapped ~~Accessibility for individuals with disability is included in the design.~~ Air conditioning (estimated 300 tons) provided ~~Provide 300 tons of cooling by geothermal water source heat pumps (geotherma.~~ Heating provided by existing base steam loop and supplemental solar arrays. Project to be designed to a platinum level Sustainable Design Rating Tool (SPiRiT) Leadership in Energy

and Environmental Design (LEED). A third party commissioning agency employed to measure and verify HVAC energy savings. Comprehensive interior design services required. Demolish one building (70,100 SF).

1). The following Sustainable Development and Design (SDD) Elements are included in the facility. Partially recycled building utilizing the existing foundation, steel structure, and wood roof decking. Two solar arrays. Water source heat pumps cooled and heated by 200 geothermal wells. Under floor air distribution used to enhance ventilation effectiveness and take advantage

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Description of Proposed Construction: (Continued)
of natural buoyancy using thermal extraction techniques. Thermostatically zoned spaces vary supply air flow with actual space loads to save energy consumption. Primary heating provided by existing base steam loop. Motor actuators designed to open operable windows and louvers. Storm water collection system to collect rainwater for reuse. Only excess rainwater that exceeds projected reuse is discharged to the site storm sewer system. Low water consumption plumbing fixtures including automatic flush valves and faucets to reduce water consumption. Domestic hot water preheat system using solar collectors, recirculation pump, water-to-water heat exchanger, and solar distribution piping loop. General office lighting consisting of indirect lighting fixtures utilizing energy efficient fluorescent lamps. Central lighting control system consisting of interior perimeter photocells, motion sensors, and local wall switches. "Energy Star" membrane roof. Lobby entrance featuring a glass curtain wall to bring natural light into the center of the building. The two administrative wings include masonry exterior walls with varying amounts of glass area to reflect the microclimate of each facades particular orientation. The visitor parking at an elevation requiring minimal grading and earthwork. Approximately 2.5 acres of mature trees replaced on a one-to-one basis at a designated on-base area. Service access road paving asphalt modified with crumb rubber. Main parking lot surfaced with a reinforced, stabilized and porous gravel paving system. Stormwater from the building and site directed via pipe to two earthen retention ponds. No net increase in the rate or quality of stormwater runoff released from the site. Storm detention facilities utilize biologically based practices to reduce post development total of suspended solids and phosphorous discharges. Landscaping installed to reduce heat islands. Use of native landscape material. Variable volume heat recovery unit used in conference center to precondition the incoming outside air by exchanging enthalpy with the outgoing exhaust air. Permanent carbon monoxide monitoring system installed to verify space ventilation. Permanent temperature and humidity monitoring and controls installed. Individual thermal control for personal comfort within HVAC zones provided. A building management system installed to optimize HVAC performance. Why are you building this facility if you have more adequate ADMIN space than you have a requirement for (over by 100K SF) A third party commissioning agency employed to measure and verify HVAC energy savings.

11. REQ: 2,269,445 SF ADQT: 2,389,460 SF SUBSTD: 71,416 SF
PROJECT:
Construct an Army Showcase, SPiRiT / LEED Platinum-Level Headquarters
Administration Building (Current Mission).

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REQUIREMENT:

This project is required to provide an adequate, modern, and consolidated administrative facility to fulfill the USAEC vision as the world's premier military environmental center and to accommodate a planned increases in

personnel (how many personnel and when are they coming???) . Identified as an Army Showcase Project by the Assistant ~~Army~~ Chief of Staff for Installation Management (ACSIM) (did MG Lust really direct this project, or did an unnamed representative of the Office of the ACSIM say to do this? If neither one, then delete statement), the new facility must be (why, says who) designed in a manner that incorporates the principles of SDD and that is worthy of both a Platinum SPiRiT ~~rating and a Platinum~~ and LEED ratings. No adequate facility exists at APG to satisfy this requirement (satisfy what requirement, admin space or platinum rated space???) .

CURRENT SITUATION:

USAEC Administrative functions are currently performed in multiple, antiquated buildings and temporary trailers scattered throughout the Edgewood Area of Aberdeen Proving Ground. The existing semi-permanent (are these the antiquated buildings or some other facilities that were not mentioned above) facilities were constructed approximately 1917 and have been upgraded periodically over the years. Building age, building condition and the physical separation of functional activities among the various structures has created substandard administrative space and related special purpose spaces. (beef up the following text describing the crowding Office spaces are crowded, there is a lack of sufficient training and conference spaces, heating/cooling systems are problematic, and there is ~~poor communication and~~ inefficiencies and impacted staff communication due to the physical separation of personnel.

IMPACT IF NOT PROVIDED:

If the project were not provided, USAEC would continue to perform administrative functions within substandard semi-permanent buildings. The use of temporary trailers to meet space needs would continue. Inefficiencies due to the physical separation of personnel in multiple facilities would continue to limit the necessary communication and collaboration among divisions. Office crowding and lack of adequate space for training and meeting activities would continue. There will be insufficient space to accommodate the planned personnel expansion. Continuation of the status quo will hinder USAEC in mission accomplishment.

ADDITIONAL: Recommend using the standard statement selector feature of the DD form 1391 processor system rather than adding the standard statements below.

This project has been coordinated with the installation physical security plan and all required physical security measures are included. Also, all required anti-terrorism/force protection measures are included. The Deputy Assistant Secretary of the Army (Installations and Housing) certifies that this project has been considered for joint use potential. JOINT USE CERTIFICATION: The facility will be available for use by other components. Sustainable principles will be integrated into the design, development, and construction of the project in accordance with Executive Order 13123 and other applicable laws and Executive Orders. An economic analysis will be prepared and be utilized in evaluating this project.

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Maryland

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Show signature as signed //S//
MARDI U. MARK
COL, OD
Commanding

ESTIMATED CONSTRUCTION START:	MAR 2006	INDEX: 2297
ESTIMATED MIDPOINT OF CONSTRUCTION:	SEP 2006	INDEX: 2319
ESTIMATED CONSTRUCTION COMPLETION:	MAR 2007	INDEX: 2340

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	Unit Cost (\$000)
U/M	Qty

PRIMARY FACILITY.

GENERAL.

61050	U.S. Army Environmental Center	SF	95,500	258.55	(24,692)
1)	Substructure	SF	95,000	12.21	1,160
2)	Superstructure	SF	95,500	31.11	2,971
3)	Exterior Closure	SF	59,730	38.74	2,314
4)	Roofing	SF	63,291	11.73	742
5)	Interior Construction	SF	95,500	43.75	4,178
6)	Interior Finishes	SF	95,500	11.43	1,092
7)	Conveying Systems	SF	95,500	1.91	182
8)	Plumbing	SF	95,500	6.66	636
9)	HVAC	SF	95,500	37.83	3,613
10)	Fire Protection Systems	SF	95,500	.86	82
11)	Electric Power And Lighting	SF	95,500	49.38	4,716
12)	Electrical Systems	SF	95,500	16.65	1,590
13)	Equipment	SF	95,500	.44	42
14)	Furnishings	SF	95,000	2.63	250
15)	Selective Building Demolition	SF	70,000	16.05	1,124

INFORMATION SYSTEMS.

80800	Building Information Systems	LS	--	--	(444)
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SUPPORTING FACILITIES.

Electric Service	LS	--	--	(111)
1) 40' Pole w/ Concrete Base	EA	7	7,608	53
2) 40' Pole w/ Concrete Base	EA	2	6,340	13
3) Bollard Lights	EA	6	2,536	15
4) Connect to Electrical Utilities	LS	--	--	6
5) Feeders - Primary/Secondary	LS	--	--	24
Water, Sewer, Gas	LS	--	--	(23)
1) 8" Water Main - Ductile Iron	LF	240	71.28	17
2) Connect to Existing Water	LS	--	--	6
Steam And/Or Chilled Water Distr	LS	--	--	(339)
1) 8" Steam - 3200 PSI Flanged	LF	1,800	184.71	332
2) Connect to Existing Steam	LS	--	--	6
Paving, Walks, Curbs And Gutters	LS	--	--	(170)
1) Sidewalk - 4"	SF	5,465	5.71	31
2) Concrete Median Barriers - 8"	SF	620	9.51	6
3) Deep Set Curb	LF	3,130	27.89	87
4) Concrete Filled Bollards - 6"	EA	70	380.38	27
5) Precast Wheel Stops - 6'	EA	270	69.74	19

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	U/M	Qty	Unit Cost	59667 Cost (\$000)
Storm Drainage	LS	--	--	(336)
1) 8" Sanitary Sewer - Cast Iron	LF	480	80.55	39
2) 15" Storm Sewer - RCP	LF	1,868	46.24	86
3) 24" Storm Sewer - RCP	LF	260	63.74	17
4) Sanitary Manhole	EA	4	6,974	28
5) Storm Sewer Manhole	EA	4	6,974	28
6) Inlets	EA	6	2,536	15
7) Endwall	EA	2	2,219	4
8) Standpipe/Outfall Structure	EA	2	6,340	13
9) Connect to Existing Storm	LS	--	--	6
10) Connect to Existing Sanitary	LS	--	--	6
11) Excavation @ Detention Pond	CY	5,926	4.44	26
12) Removing Spoils	CY	5,926	10.14	60
13) Vegetative Lining @ Deten. Pond	SF	20,000	.32	6
14) Rip Rap @ End Walls	TON	16	38.04	1
Site Improvement/Demolition	LS	--	--	(890)
1) Strip & Stockpile Topsoil - 6"	CY	1,389	4.44	6
2) Spread Top Soil	CY	1,389	4.44	6
3) Fine Grading	SY	15,338	1.71	26
4) Clearing & Grubbing Trees	AC	2.20	5,821	13
5) Seeding	SF	57,372	.10	6
6) Landscaping	LS	--	--	32

7)	Reforestation - 1 1/2' Cal Tree	EA	390	380.38	148
8)	Gravel Pave System @ Mat	SF	108,700	4.18	454
9)	Gravel Base & Topping @ Pave Sy	TON	4,688	31.70	149
10)	Handicap Sign w/ Pole & Base	EA	6	443.77	3
11)	Flagpole w/ Concrete Base	EA	3	9,509	29
12)	Remove Gravel Road - 6" - Sprea	CY	773	10.14	8
13)	Reinstall Brick as Pavers	SF	850	12.68	11
14)	Building Demolition D	SF	70,100	16.05	1,124
Information Systems			LS	--	(356)
1)	80800 Information Systems	LS	--	--	356
Antiterrorism/Force Protection			LS	--	(19)
1)	Automatic Gates @ Service Dock	EA	2	9,509	19

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TAB B - PLANNING AND DESIGN DATA (ESTIMATE)

1. STATUS
 - A. DESIGN START DATE.....
 - B. PERCENT COMPLETE AS OF 15 SEP 2004 (DSGN YR) .00
 - C. PERCENT COMPLETE AS OF 01 JAN 2005 (BDGT YR) .00
 - D. PERCENT COMPLETE AS OF 01 OCT 2005 (PROG YR) .00
 - E. CONCEPT COMPLETE DATE.....
 - F. DESIGN COMPLETE-DATE.....
 - G. TYPE OF DESIGN CONTRACT:
2. BASIS
 - A. STANDARD OR DEFINITIVE DESIGN (YES/NO)
 - B. WHERE DESIGN WAS MOST RECENTLY USED:
3. COST (TOTAL \$000)
 - A. PRODUCTION OF PLANS AND SPECS.....
 - B. ALL OTHER DESIGN COST.....
 - C. TOTAL DESIGN COST (C) = (A)+(B) OR (D)+(E)..
 - D. CONTRACT.....
 - E. IN HOUSE.....
4. CONSTRUCTION CONTRACT AWARD.....
5. CONSTRUCTION START DATE (PLANNED).....
6. CONSTRUCTION COMPLETION DATE.....

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TAB C - QUANTITATIVE DATA

TYPE OF DESIGN: This facility includes unusual construction features that require extra design effort.

COOLING	CAPACITY (TONS)	COST (\$000)
-----	-----	-----
Air Conditioning	300	0

UNIT OF MEASURE: SF

A.	TOTAL REQUIREMENT	2,269,445
B.	EXISTING SUBSTANDARD	71,416
C.	EXISTING ADEQUATE	2,389,460
D.	FUNDED, NOT INVENTORY	0
E.	ADEQUATE ASSETS	2,389,460
////////////////////		AUTHORIZED FUNDED

F. UNFUNDED PRIOR AUTHORIZATION 0 ////////////////
 G. INCLUDED IN FY PROGRAM 0
 H. DEFICIENCY (A-E-F-G) -120,015 -120,015

REMARKS:

~~SITE SELECTION. The site for the USAEC Headquarters Administration Building was selected at a SDD and DD Form 1391 planning charrette held on 24-25 October 2002. Site 4 is situated in the Edgewood Area of Aberdeen Proving Ground at Schaefer Road. The site currently contains an existing DRMO warehouse (Building E1890) along with associated roads and parking area.~~

~~SUSTAINABLE DEVELOPMENT AND DESIGN. The USAEC Headquarters Administration Building will be an Army Showcase project designed to achieve both a SPiRiT and LEED Platinum-level rating. The building will be a prototype, which will display a range of design features that could be tested and then adapted to SDD projects the Army will construct in the future. The project will demonstrate a number of sustainability features that incorporate the innovative application of existing technologies. The building will also be a platform for the plug-and-play integration of emerging technologies, as they become available. In this regard, the USAEC Headquarters Administration Building will serve as a living laboratory. In addition to the featured SPiRiT and LEED systems, the project will strive to incorporate the following general sustainability concepts: low energy/high performance; replenishable sources;~~

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~~TAB C - QUANTITATIVE DATA~~

~~REMARKS: (CONTD)..~~

~~recycling; embodied energy; long life, loose fit; total life cycle costing; embedded in place; access and urban context; health and happiness; and community and connection.~~

~~SPACE REQUIREMENT. Army Regulation 405-70 Utilization of Real Property defines administrative space requirements as the sum of required office space, storage area, and special space. The algorithm for determining authorized administrative space for new construction is:~~

~~NUMBER OF AUTHORIZED PERSONNEL X 162 GSF + (1.25 X NSF OF STORAGE AND SPECIAL PURPOSE SPACE) = TOTAL GROSS SQUARE FEET AUTHORIZED.~~

~~The USAEC Headquarters Administration Building is proposed as a 95,500 GSF building. This requirement is based on USAEC's projected future personnel count of 450 persons (450 x 162 GSF = 72,900 GSF) plus a total of 22,600 GSF of storage and special purpose space. The requirement for storage space is based on Table D-3 of AR 405-70 and specialized standards, as applicable. The requirement for special space is based on Table D-4 of AR 405-70 and specialized standards, as applicable. USAEC requires the following storage and special spaces: 250-Seat Conference Center/Auditorium, Training Space/Classrooms (total 50 seats in 3 rooms), Technical Information Center (i.e., records storage), Law Library, Special Purpose Computing, Conference Rooms (eight 10-seat rooms and seven 20-seat rooms), 30-Seat Video Conference Center, Lobby/Reception Area, 45-Seat Cafeteria, and Multimedia Production Facility.~~

~~CONFERENCE CENTER/AUDITORIUM. In addition to office space, the project will also include a conference center featuring an auditorium (seating 250 persons), meeting rooms, and training facilities. The conference facility will be located at the center of the building and can be used by the installation community. The center will be accessed from the main building entry lobby. This lobby will be used for pre and post-conference events. An electronic kiosk will be included in the lobby to present information about the USAEC and the showcase building design.~~

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TAB C - GENERAL JUSTIFICATION DATA

GENERAL:

SITE SELECTION. The site for the USAEC Headquarters Administration Building was selected at a SDD and DD Form 1391 planning charette held on 24 - 25 October 2002. Site 4 is situated in the Edgewood Area of Aberdeen Proving Ground at Schaefer Road. The site currently contains an existing DRMO warehouse (Building E1890) along with associated roads and parking area.

ADD - This project is in accordance with the installation master plan.

The FOLLOWING INFORMATION WAS MOVED FROM THE FRONT PAGE DESCRIPTION OF PROPOSED CONSTRUCTION. NOT APPROPRIATE TO BE ON THE FRONT PAGE, BUT RATHER AS CONSTRUCTION CRITERIA.

CRITERIA FOR PROPOSED CONSTRUCTION

The following Sustainable Development and Design (SDD) Elements are included in the facility. Partially recycled building utilizing the existing foundation, steel structure, and wood roof decking. Two solar arrays. Water source heat pumps cooled and heated by 200 geothermal wells. Under floor air distribution used to enhance ventilation effectiveness and take advantage of natural buoyancy using thermal extraction techniques. Thermostatically zoned spaces vary supply air flow with actual space loads to save energy consumption. Motor actuators designed to open operable windows and louvers. Storm water collection system to collect rainwater for reuse. Only excess rainwater that exceeds projected reuse is discharged to the site storm sewer system. Low water consumption plumbing fixtures including automatic flush valves and faucets to reduce water consumption. Domestic hot water preheat system using solar collectors, recirculation pump, water-to-water heat exchanger, and solar distribution piping loop. General office lighting consisting of indirect lighting fixtures utilizing energy efficient fluorescent lamps. Central lighting control system consisting of interior perimeter photocells, motion sensors, and local wall switches. "Energy-Star" membrane roof. Lobby entrance featuring a glass curtain wall to bring natural light into the center of the building. The two administrative wings include masonry exterior walls with varying amounts of glass area to reflect the microclimate of each facades particular orientation. The visitor parking at an elevation requiring minimal grading and earthwork. Service access road paving asphalt modified with crumb rubber. Main parking lot surfaced with a reinforced, stabilized and porous gravel paving system. Stormwater from the building and site directed via pipe to two earthen retention ponds. No net increase in the rate or quality of stormwater runoff released from the site. Storm detention facilities utilize biologically based practices to reduce post development total of suspended solids and phosphorous discharges. Landscaping installed to reduce heat islands. Use of native landscape material. Variable volume heat recovery unit used in conference center to precondition the incoming outside air by exchanging enthalpy with the outgoing exhaust air. Permanent carbon monoxide monitoring system installed to verify space ventilation. Permanent temperature and humidity monitoring and controls installed. Individual thermal control for personal comfort within HVAC zones provided. A building management system installed to optimize HVAC performance.

SUSTAINABLE DEVELOPMENT AND DESIGN. The USAEC Headquarters Administration Building will be an Army Showcase project designed to achieve both a SPiRiT and LEED Platinum-level rating. The building will be a prototype, which will display a range of design features that could be tested and then adapted to SDD projects the Army will construct in the future. The project will demonstrate a number of sustainability features that incorporate the innovative application of existing technologies. The building will also be a platform for the plug-and-play integration of emerging technologies, as they become available. In this regard, the USAEC Headquarters Administration Building will serve as a living laboratory. In addition to the featured SPiRiT and LEED systems, the project will strive to incorporate the following general sustainability concepts: low energy/high performance; replenishable sources; recycling; embodied energy; long life, loose fit; total life cycle costing; embedded in place; access and urban context; health and happiness; and community and connection.

SPACE REQUIREMENT. Army Regulation 405-70 Utilization of Real Property defines administrative space requirements as the sum of required office space, storage area, and special space. The algorithm for determining authorized administrative space for new construction is:

NUMBER OF AUTHORIZED PERSONNEL X 162 GSF + (1.25 X NSF OF STORAGE AND SPECIAL PURPOSE SPACE) = TOTAL GROSS SQUARE FEET AUTHORIZED.

The USAEC Headquarters Administration Building is proposed as a 95,500 GSF building. This requirement is based on USAEC's projected future personnel count of 450 persons (450 x 162 GSF = 72,900 GSF) plus a total of 22,600 GSF of storage and special purpose space. The requirement for storage space is based on Table D-3 of AR 405-70 and specialized standards, as applicable. The

requirement for special space is based on Table D-4 of AR 405-70 and specialized standards, as applicable. USAEC requires the following storage and special spaces: 250-Seat Conference Center/Auditorium, Training Space/Classrooms (total 50 seats in 3 rooms), Technical Information Center (i.e., records storage), Law Library, Special Purpose Computing, Conference Rooms (eight 10-seat rooms and seven 20-seat rooms), 30-Seat Video Conference Center, Lobby/Reception Area, 45-Seat Cafeteria, and Multimedia Production Facility.

CONFERENCE CENTER/AUDITORIUM. In addition to office space, the project will also include a conference center featuring an auditorium (seating 250 persons), meeting rooms, and training facilities. The conference facility will be located at the center of the building and can be used by the installation community. The center will be accessed from the main building entry lobby. This lobby will be used for pre- and post-conference events. An electronic kiosk will be included in the lobby to present information about the USAEC and the showcase building design.

TRAFFIC ANALYSIS (STANDARD TEXT)

A Traffic Analysis does not apply to this project. (why not. Your moving a lot of folks around the installation? Do one unless already done under another action for the installation.)

Installation Engineer: HEATHER COURSEY
Phone Number: 410-306-1125

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Add the objective of the analysis □ like □provide consolidated administrative space for the Army Environmental Center□

Put the items below in an alternatives listing, discussing each item and costing the feasible alternatives (like new construction and the new construction/reuse mix. List them in the order of:

1. Status Quo
2. Renovation
3. Renovation/Construction
4. Lease
5. Other (if appropriate)

ECONOMIC ANALYSIS

The range of options considered for this analysis include the following:
Modification of Existing Assets (Construction and Renovation Mix),
Modification of Existing Assets (Renovation), New Construction, Status Quo (Do Nothing), Use of Other Government Facilities, Lease Off-Site Facilities, and Contract Service or Product from the Civilian Sector.

The following options were rejected as infeasible and thus not included in this economic analysis:

Use of Other Government Facilities The option to utilize existing facilities at nearby DoD installations was eliminated from further consideration, as there are no nearby facilities available to meet the requirement of providing an Army Showcase, SPiRiT/LEED Platinum-level administrative facility.

Lease Off-Site Facilities The option to lease available off-site facilities was eliminated from further consideration because there are no known nearby off-site facilities available to meet the requirement of providing an Army Showcase, SPiRiT/LEED Platinum-level administrative facility.

Contract Service or Product from the Civilian Sector The option to contract service or product from the civilian sector was eliminated from further consideration, as it is not applicable to the requirement.

The following three alternatives are analyzed: Construction and Renovation Mix, Renovation, New Construction, and Status Quo.

Alternative 1: Construction and Renovation Mix The Construction and Renovation Mix Alternative will provide a total of 95,500 GSF of required Administrative space. Specifically, existing Building E1890 DRMO Warehouse

(Site 4 Edgewood Area) will be selectively demolished, portions of the building will be reused as part of the new construction project, and the new USAEC Headquarters Administration Building will be constructed atop the a portion of the existing foundation. This USAEC Headquarters Administration Building will be an Army Showcase project designed to achieve both a SPiRiT and LEED Platinum-level rating. The following buildings currently occupied by USAEC will be vacated upon completion of this project and will be turned over to the Garrison: E4415, E4430, E4435, E4460, and E4480. Buildings E5060 and E5179, USAEC storage facilities, will be retained and remain occupied.

Alternative 2: Renovation Under the Renovation Alternative, a total of 95,500 GSF of required administrative space will be provided. Specifically, existing Building E1890 DRMO Warehouse (Site 4 Edgewood Area) will be

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renovated. This USAEC Headquarters Administration Building will be an Army Showcase project designed to achieve both a SPiRiT and LEED Platinum-level rating. The following buildings currently occupied by USAEC will be vacated upon completion of this project and will be turned over to the Garrison: E4415, E4430, E4435, E4460, and E4480. Buildings E5060 and E5179, USAEC storage facilities, will be retained and remain occupied.

Alternative 3: New Construction The New Construction Alternative will provide a total of 95,500 GSF of required Administrative space. Specifically, a new building will be constructed on Site 1A in the Edgewood Area. This USAEC Headquarters Administration Building will be an Army Showcase project designed to achieve both a SPiRiT and LEED Platinum-level rating. Existing buildings located on the site are anticipated to be demolished at the cost of the current owner (SBCCOM). The following buildings currently occupied by USAEC will be vacated upon completion of this project and will be turned over to the Garrison: E4415, E4430, E4435, E4460, and E4480. Buildings E5060 and E5179, USAEC storage facilities, will be retained and remain occupied.

Alternative 4: Status Quo (Do Nothing) Under the status quo condition, USAEC Administrative functions are currently performed in multiple, semi-permanent facilities (1917 vintage) and temporary trailers scattered throughout the Edgewood Area of Aberdeen Proving Ground. USAEC Administrative functions would continue to operate within buildings E4415, E4430, E4435, E4460, and E4480. USAEC storage functions would continue to operate within buildings E5060 and E5179. Achieving Army Sustainable Development and Design (SDD) objectives would be impossible under current conditions.

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TAB E - FURNISHINGS AND EQUIPMENT

FURNISHINGS AND EQUIPMENT

LINE	DESCRIPTION	TOTAL COST	PROC APPR FY	PROC APPR
1)	Furn/Workstations	2,678	2006	OMA

LINE	EST. DELIVERY DATE	PROC STATUS	EST. INSTL COST	INSTL FY	INSTL APPR
1)	(CONT'D)		0	0000	

INFORMATION SYSTEMS FURNISHINGS AND EQUIPMENT

LINE	DESCRIPTION	TOTAL COST	PROC APPR FY	PROC APPR
------	-------------	---------------	--------------------	--------------

1)	Info Sys - ISC	81	2007	OPA
2)	Info Sys - PROP	21	2007	RDT&E

LINE	EST. DELIVERY DATE	PROC STATUS	EST. INSTL COST	INSTL FY	INSTL APPR
1)	(CONT'D)		0	0000	
2)	(CONT'D)		0	0000	

TOTALS BY APPROPRIATION TYPE:
 TOTAL OMA/OMN/3400/OM DHP: 2,678
 INSTALLED EQUIPMENT - OTHER APPROPRIATIONS: 102
 TOTAL RELATED FURNITURE & EQUIPMENT AMOUNT: 2,780

FURNISHINGS AND EQUIPMENT DISCUSSION

Discuss the quantity of occupants, cost of workstations, etc.

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TAB E - FURNISHINGS AND EQUIPMENT

FURNISHINGS AND EQUIPMENT DISCUSSION (CONTD)..

~~As a Category II site, the Directorate of Safety, Health and Environment requires magnetometry sweeps. Potential for OMA funded 4 acres unexploded ordnance clearing to be accomplished prior to construction start. Potential for OMA funded environmental remediation and cleanup to provide a clean site for this MCA project.~~

Add some text describing how many people (450 persons), how many workstations, etc. Will help in the upcoming years as to when and how much furniture is needed. Also helps in tracking when the OMA requests must go in from the mission side.

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE):

INSTALLATION - Aberdeen Proving Ground YEAR - 2006 FNO - 59667
 PROGRAM TYPE - MCA PROJECT NO. - 59667
 USACE DISTRICT - NAB MACOM - AMC
 PROJECT TITLE - Administrative Facility, SPiRiT/LEE
 PRIMARY PROPONENT FUND TYPE - RDT&E CONTGY FACTOR - 5.00

SECTION I. PRIMARY FACILITY, INSIDE THE 5 FOOT LINE - INSTALLED EQUIPMENT (SEE AR 415-15, APPENDIX L)

DESCRIPTION	UM	QUANTITY	UNIT PRICE	TOTAL COST	F T
1) BACKBOARD 4' X 8' X 3/4"	EA	8	51.16	409	C
2) DATA: EQUIPMENT CABINET 19"	EA	4	2442.89	9772	C
3) CABLE TRAY (24" WIDE)	LF	500	22.44	11220	C
4) UNDERFLOOR DUCT, 8" X 8"	LF	500	107.20	53600	C
			TOTAL	75001	

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE): (CONTD)..

SECTION II. PRIMARY FACILITY, INSIDE THE 5 FOOT LINE -
EQUIPMENT IN PLACE (SEE AR 415-15, APPENDIX L)

DESCRIPTION	UM	QUANTITY	UNIT PRICE	TOTAL COST	F T
1) PHONE: ISDN, 2B+D	EA	20	638.98	12780	P
2) PHONE: 2500 TYPE	EA	300	58.21	17463	I
3) FO ST PATCH PNL 48 MM W/CPLRS	EA	1	812.33	812	C
4) FO ST PATCH PNL 48 SM W/CPLRS	EA	1	812.33	812	C
5) PHONE: MULTILINE	EA	150	378.65	56798	I
6) OUTLET: SINGLE RJ45	EA	100	28.77	2877	C
7) MDF JUMPER PUNCH DOWN	EA	500	2.08	1040	C
8) PHONE: WEATHER-PROOF	EA	4	692.46	2770	I
9) PATCH PNL, RJ45 CAT 5, 96 PORT	EA	15	539.19	8088	C
10) PATCH CORD: RJ45 CAT 5, 7 FT	EA	2700	5.31	14337	C
11) BLOCK: 110 TYPE, 300 PR	EA	10	380.46	3805	C
12) OUTLET: DUAL RJ45	EA	900	39.75	35775	C
13) STA CBL: CAT 5 UTP (4 PR)	LF	310000	.76	235600	C
14) PATCH CORD: RJ45 CAT 5, 15 FT	EA	100	7.64	764	C
15) RISER: 200 PR INSIDE PLANT CBL	LF	1000	4.32	4320	C
16) FOC-MM RISER CABLE: 24 STRANDS	LF	500	4.92	2460	C
17) FOC-SM RISER CABLE: 24 STRANDS	LF	500	12.15	6075	C
18) DATA: UNINTERRUPT PWR SYST (UP KVA		2	2938.77	5878	P
19) LAN UPS, 1000 VA W/PWR CHUTE+	EA	2	629.33	1259	P
20) FO ST CONNECTOR MM INSTALLED	EA	144	58.35	8402	C
21) FO ST CONNECTOR SM INSTALLED	EA	144	94.31	13581	C
22) FO ST PATCH PNL 24 MM W/CPLRS	EA	2	425.86	852	C
23) FO ST PATCH PNL 24 SM W/CPLRS	EA	2	425.86	852	C
24) PROTECTED TERMINAL: 100 PR	EA	24	1180.74	28338	C
25) 5.00% Contgy Factor	LS	0	.00	3852	I
26) 5.00% Contgy Factor	LS	0	.00	996	P

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE): (CONTD)..

TOTAL 470586

PRIMARY FACILITY NOTES:

Approximately [450] personnel will ultimately require telephone service in this facility; immediate requirement for telephone service is for [450] personnel. [LAN system is required as follows: Average 2.5 drops per person. Hub requirements are for a Gigabit switch with the ability to feed other units within the building. All LAN hubs will be Gigabit uplink; S/C connector. [specify LAN hub requirements by service type [10Base-T, 10Base-F, FDDI, FDDI Bridge, etc.] and LAN network interface requirements by type--]. [A requirement for fiber optic LAN connectivity has been identified for [450] personnel. [A standard outlet density of one outlet per 80 square feet is required in this facility.] [A modified outlet density of one outlet per [40] square feet is required in this facility.] [450] new telephone sets are required. [[There is requirement for 150 Avaya digital sets, 20 Avaya ISDN sets and 300 Avaya 2500 type sets with Caller ID feature and v/m indicator light. [specify type-]] special feature telephone sets, [specify type-], are required. CATV/CCTV requirements include:

[__--specify CATV/CCTV requirements--__]. Special requirements include:
[Weatherproof sets to be installed at all entry points to the
building.__--specify special requirements--__]

SECTION III. SUPPORTING FACILITIES, OUTSIDE THE 5 FOOT LINE -
INSTALLED EQUIPMENT (SEE AR 415-15, APPENDIX L)

DESCRIPTION	UM	QUANTITY	UNIT PRICE	TOTAL COST	F T
1) MANHOLE PRECAST 6'X12'X7'	EA	12	6084.04	73008	C
2) HANDHOLE PRECAST 4'X4'X4'	EA	2	2446.94	4894	C
3) UNDERGRND DUCT 4 WAY	LF	6000	8.95	53700	C
4) UNDERGRND DUCT 4 WAY CONC ENC	LF	100	15.90	1590	C
5) CUT & RESURFACE ASP 10"	SF	100	9.20	920	C
6) TRENCH BACKHOE 24"X 36"	LF	6000	6.20	37200	C

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE): (CONTD)..

TOTAL 171312

SECTION IV. SUPPORTING FACILITIES, OUTSIDE THE 5 FOOT LINE -
EQUIPMENT IN PLACE (SEE AR 415-15, APPENDIX L)

DESCRIPTION	UM	QUANTITY	UNIT PRICE	TOTAL COST	F T
1) CABLE UNDERGRND: 1200 PR, 24 A LF	LF	6000	12.13	72780	C
2) CABLE UNDERGRND SPLICE CASE	EA	2	439.50	879	C
3) CABLE UNDERGRND PAIRS SPLICED	EA	2400	.92	2208	C
4) FOC-MM, UNDERGRND: 48 STRANDS	LF	6000	11.76	70560	C
5) FOC-SM, UNDERGRND: 48 STRANDS	LF	6000	6.42	38520	C

TOTAL 184947

SUPPORTING FACILITIES NOTES:

Telephone cable service can be had [__6000__] feet from the project site at location: [__Building E5103.]. Fiber optic LAN/WAN cable service can be had [__6000__] feet from the project site at location: [__Building E5103.]. [New copper cable(s) will be required as follows: [__--6000 feet of 24 ga U/G cable__].] [New fiber optic cable(s) will be required as follows: [__6000 feet of 96 strand U/G composite fiber optics, and 500 feet of 48 strand house composite fiber cable] [__12__] manhole(s) are required; buried duct is required as follows: [__24000 feet of 4 inch duct (6000 linear feet with 4ea 4 inch ducts).] Special requirements include: [__-- specify special requirements--__].

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE): (CONTD)..

INFORMATION SYSTEMS COST SUMMARY:

CONF	ISC	PROP	TOTAL
------	-----	------	-------

PRIMARY FACILITY	443791	80883	20913	545587
SUPPORTING FACILITIES	356259	0	0	356259
	-----	-----	-----	-----
TOTAL	800050	80883	20913	901846

REMARKS:

This project is associated with MCA Project Number: [____]. The outside plant in this projects also supports requirements associated with MCA Project Number: [____]. [Local agreements require that the government provide [____specify any local agreement that impact the information system, i.e.: government provide access to outside plant manhole and duct system for commercial telephone and/or CATV service; government does/does not provide cable barracks telephone/CATV outlets; etc.]. Special requirements include: [____ specify special requirements--____].

/S/ Brian Duff 11/20/2002
Telecommunications Specialist
USAGAPG DOIM

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TAB G - ANTITERRORISM/FORCE PROTECTION REQUIREMENTS DATA WITH SIGNATURES

ANTITERRORISM/FORCE PROTECTION (STANDARD TEXT)

This project has been coordinated with the installation antiterrorism/force protection plan. Risk and threat analyses have been performed in accordance with DA PAM 190-51 and TM 5-853-1, respectively. Only protective measures required by regulation and the minimum standards as required by the current Department of Defense Minimum Antiterrorism Standards for Buildings are needed. These requirements are included in the description of construction and cost estimate.

SUMMARY OF RISK AND THREAT ANALYSES AND DESCRIPTION OF ANY PROTECTIVE MEASURES THAT ARE REQUIRED.

Automatic gates to be provided at the Service Dock.

REQUIRED SIGNATURES:

PROVOST MARSHAL

ROBERT KRAUER
GS-14
Director
DATE??

DIRECTOR OF PUBLIC WORKS

BERT R. SCOTT III
GS-15
Director
DATE???
Installation Security Officer

//S//

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TAB H - PRESENT ACCOMMODATIONS AND DISPOSITIONS

ACCOMMODATIONS NOW IN USE AND DEMOLITIONS

ARLOC	INSTALLATION	BLDG NO	PRES CAT CODE	T C	TOTAL QTY	UM	AREA OCPD	D PLAN S CAT F CODE
1)	24004 Aberdeen Provi	E1890	44220	P	70,100	SF	70,100	D
FOOTNOTES: Existing Building E1890 DRMO Warehouse is proposed to be selectively demolished. Portions of the steel framing, wood decking, and foundation will be reused as part of the USAEC Headquarters Administrative Building new construction project.								
2)	24004 Aberdeen Provi	E4415	61050	S	19,247	SF	5,261	R 61050
FOOTNOTES: USAEC will vacate								
3)	24004 Aberdeen Provi	E4430	61050	S	16,648	SF	7,656	R 61050
FOOTNOTES: USAEC will vacate								
4)	24004 Aberdeen Provi	E4435	61050	S	16,648	SF	13,220	R 61050
FOOTNOTES: USAEC will vacate								
5)	24004 Aberdeen Provi	E4460	61050	S	16,648	SF	16,648	R 61050
FOOTNOTES: USAEC will vacate								
6)	24004 Aberdeen Provi	E4480	61050	S	17,678	SF	17,678	R 61050
FOOTNOTES: USAEC to vacate								
7)	24004 Aberdeen Provi	E5060	44220	P	25,652	SF	12,826	R 44220
FOOTNOTES: USAEC will continue to occupy								
8)	24004 Aberdeen Provi	E5179	44220	P	41,691	SF	5,720	R 44220
FOOTNOTES: USAEC will continue to occupy								

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TAB H - PRESENT ACCOMMODATIONS AND DISPOSITIONS

TOTAL NUMBER OF BUILDINGS TO DEMOLISH = 1
TOTAL NUMBER OF BUILDINGS TO RETAIN = 7
TOTAL AREA OF BUILDINGS TO DEMOLISH = 70,100 SF
TOTAL AREA OF BUILDINGS TO RETAIN = 154,212 SF

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TAB I - REAL PROPERTY MAINTENANCE ACTIVITY (RPMA) AND ENVIRONMENTAL COMPLIANCE

RPMA DISCUSSION

An existing building, Building E1890, will be selectively demolished. Some building materials and portions of the building foundation will be reused as part of the project. Therefore, any backlog of maintenance and repair (BMAR) associated with Building E1890 will be eliminated by this project. Building E1890, containing a 70,100 GSF, will be removed from the installation inventory as part of this project. One building containing a total of 95,500 GSF, the USAEC Headquarters Administration Building, will be added to the installation inventory. Workload and resource impacts will include utility and maintenance costs for the proposed USAEC Headquarters Administration Building. Utility and building maintenance costs will be determined during final project design.

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TAB J - ENVIRONMENTAL ANALYSIS

ENVIRONMENTAL DOCUMENTATION

It has been determined that the appropriate level of environmental documentation for this project is an environmental assessment (EA). The EA will consider three sites chosen at the SDD and DD Form 1391 Planning Charrette held in October 2002. The three sites under consideration are located in the Edgewood Area of Aberdeen Proving Ground: Site 1A, Site 2, and Site 4. The preferred alternative will be analyzed in detail. Completion of an EA and Finding of No Significant Impact (FONSI) is anticipated prior to March 2003.

ROBERT SOYLAN Directorate of Safety, Health and Environment Pollution Prevention Program Manager

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

From a safety perspective, Site 4 is a Category II. As such, DSHE has determined that magnetometry sweeps of the site will be required. The following text was pulled from TAB E Furnishings and Equipment. □ As a Category II site, the Directorate of Safety, Health and Environment requires magnetometry sweeps. Potential for OMA funded 4 acres unexploded ordnance clearing to be accomplished prior to construction start. Potential for OMA funded environmental remediation and cleanup to provide a clean site for this MCA project.

If these sweeps are indeed required, recommend installation complete prior or to meet the March 03 FONSI completion date. Based upon findings, installation should program for site cleanup utilizing installation SRM funding and complete prior to FY 06 program budget lock, summer FY 04.

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TAB J - EVALUATION OF FLOOD HAZARDS AND ENCROACHMENT ON WETLANDS

EVALUATION OF FLOOD HAZARDS AND ENCROACHMENT

The site is not located within a floodplain.

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TAB J - PROVISIONS FOR THE HANDICAPPED

PROVISION FOR THE HANDICAPPED (STANDARD TEXT)

The physically handicapped will be provided for (PL 90-480).
 The estimated count of civilian employees and civilian users
 Is How many occupants of the building (450?)

TAB J Energy discussion???

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TAB J - COMMERCIAL ACTIVITIES

CA ANALYSIS CONCLUSIONS

USAEC activities are not subject to the APG Garrison A-76 (Commercial Activities Study) process.

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Maryland			
Chemical, Biological and Radiological			
	310 10	52093	12,000
PRIMARY FACILITY			
Agent Facility	LS	--	9,108
Administrative Facility, General	SF	2,100	(7,749)
Building Information Systems	LS	--	(1,316)
			(43)
SUPPORTING FACILITIES			
Electric Service	LS	--	1,662
Water, Sewer, Gas	LS	--	(106)
Steam And/Or Chilled Water Distr	LS	--	(79)
Paving, Walks, Curbs And Gutters	LS	--	(212)
Storm Drainage	LS	--	(238)
Site Imp(75) Demo(426)	LS	--	(27)
Information Systems	LS	--	(501)
Antiterrorism/Force Protection	LS	--	(58)
Other	LS	--	(150)
			(291)
ESTIMATED CONTRACT COST			10,770
CONTINGENCY PERCENT (5.00%)			539
SUBTOTAL			11,309
SUPERVISION, INSPECTION & OVERHEAD (5.70%)			645
TOTAL REQUEST			11,954
TOTAL REQUEST (ROUNDED)			12,000
INSTALLED EQT-OTHER APPROPRIATIONS			(1,142)

Construct a ~~26,000 SF~~ Chemical, biological and radiological (CBR) sample receiving facility. Construction of this facility requires the reconfiguration of an existing structural steel framed, concrete slab on grade building shell to include providing interior and exterior construction, installation/completion of utilities, waste handling system, toxic filtration system, low level monitoring system and intrusion detection system and utilizing the ~~+~~. In addition, the following already in-place items are already in place; concrete masonry enclosed electrical room and five carbon steel storage tanks. Construction will require the reconfiguring of the existing ~~26,000 SF~~ shell to include providing interior and exterior construction, installation/completion of utilities, waste handling system, toxic filtration system, low level monitoring system and intrusion detection system. This facility will include a main facility with chemical agent storage, transfer and laboratory rooms, and administrative support space, ~~+~~ Unique mechanical and electrical systems to include 100 percent conditioned make - up air, fume hoods, glove boxes, bag-in-bag-out high efficiency gas absorbent (HEGA) filter units, hazardous material tank system, emergency generator and uninterrupted power supply (UPS). COMMENT: IF THE EMERGENCY GENERATOR AND UPS IS FOR THE ENTIRE BUILDING, THEN CAN BE MCA FUNDED. IF ONLY FOR SYSTEMS WITHIN THE BUILDING, THEN IT SHOULD BE OPA FUNDED) CURRENTLY I DON'T SEE IT IN THE MCA COST ESTIMATE. IF MCA, ADD TO ESTIMATE. Construction also includes reuse and modifications to an existing pre-engineered steel frame building (9,475 SF) to a neat agent and CBR sample receiving facility. This work includes upgrades to the toxic filtration system, low level monitoring system and intrusion detection system. An access control structure is also included. AT/FP includes laminated glass. Supporting facilities to provide include: connections to water, sewer, electrical, and steam services; fire protection and alarm systems, paving,

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Chemical, Biological and Radiological (CBR) Sample

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Description of Proposed Construction: (Continued)

sidewalks, curbs, gutters, storm drainage, information systems; and some site improvements. Antiterrorism/Force Protection (ATFP) measures include laminated glass, access control structure, passive vehicle barriers and double security fence. AT/FP measures include passive vehicle barriers and double security fence. Access for the handicapped will be provided.

~~Alter a 9,475 SF building to support the CBR sample receiving facility. The building is currently a pre-engineered steel frame structure with composite panel roof and walls. This building will be converted from a dilute agent facility to a neat agent facility to support the CBR sample receiving facility mission. This conversion/alteration will require upgrades to the toxic filtration system, low level monitoring system and intrusion detection system. Propose to site project at current ABCDF Chem Demil site which has ample utilities and site improvements. Expect project cost to be decreased by \$3 million. Demolition of two buildings (-of 321,888 5,475-SF) is included.~~

ADD THE FOLLOWING STATEMENT TO ABOVE. - Air conditioning (estimated _____ tons) and heating provided by ??? (self contained systems or existing central distribution plant???)

11. REQ: 743,738 SF ADQT: 574,658 SF SUBSTD: 133,605 SF
PROJECT:

Provide a Chemical, biological and radiological (CBR) sample receiving facility ~~Complete construction on one building and alter one building to carry out a chemical, biological, radiological sample receiving function. (Current Mission).~~

REQUIREMENT:

This project is required to provide facilities to receive, triage, sample and analyze "unknowns" coming from military theaters of operation, law enforcement agencies and intelligence organizations. SBCCOM is the first stop for true unknowns - either samples or devices that can contain lethal agents. The nation currently has a single facility the Chemical Transfer Facility (CTF) located at Edgewood, MD, which can triage, remotely access and concurrently sample/screen samples for military unique chemical agents, toxic chemicals, microbiologicals, biological toxins, radioactive materials and energetic/explosive materials. There exists at Edgewood a trained cadre of material handling experts certified to work with the broad range of lethal agents.

SBCCOM has the mission for CBR sample receipt and analysis for the Combatant Commanders CINC's and DoD intelligence organizations and provides unique support to domestic law enforcement agencies. In the last 6 years this workload has increased and since Sept 11th has seen an increasing role and workload in domestic samples. Recent events have overwhelmed other DoD, National Labs and public health services with sample analysis.

ECBC operates highly specialized buildings, facilities and infrastructure that are required to safely handle supertoxic chemical and biological agents. This includes the development and employment of high throughput, robotic sample screening and analysis systems. These facilities require robust safety and environmental infrastructure to ensure that personnel, the local community

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REQUIREMENT: (Continued)
and the environment are safe.

The primary mission of the facility is to receive, triage, sample and analyze "unknowns" coming from military theaters of operation, law enforcement agencies and intelligence organizations. These operations require engineering controls for the safe handling of samples, IEDs or IDs which may contain lethal chemical agents, biological agents up to Biosafety level III (BSL-3), biological toxins (mid-spectrum agents), radionuclides as well as potential energetic materials up to 5 lb TNT equivalent. A gamma irradiator is used to effectively destroy any biological materials prior to shipment to other laboratory facilities for detailed analysis.

The intelligence and law enforcement community relies heavily on SBCCOM to

receive, evaluate, sample and analyze devices and munitions. As an example, home made devices identified in a crime scene scenario are often constructed using pressurized vessels, sealed containers or other improvised construction. Standard field protocols for sample extraction become impossible and require a sophisticated and multi-layered approach to the evaluation process. SBCCOM has the capability to use non-destructive technologies such as industrial x-ray equipment and neutron activation equipment (PINS). In addition, ECBC can perform destructive evaluations such as remote drilling of containers, controlled explosives detonation, and controlled pressure regulation. The proposed facility will expand on current CTF remote drilling operations to include the capability to evaluate and sample devices with a TNT equivalent of 5 lbs. The facility will be capable of safely removing chemical, biological, radioactive or energetic/explosive materials from improvised devices and munitions. The building will have an area which is hardened to allow overpressure resulting from the potential detonation of 5 lb TNT equivalent. This area will have an independent exhaust and makeup air filtration system which can withstand the overpressure.

The new facility will be capable of 24 hour, 365 day operations in order to respond to true national emergencies. The proposed facility will embrace new developments in high throughput sample analysis. Robotic high throughput systems will allow the facility to cope with surges in unknown samples in a cost effective and safe manner while incorporating some of the latest analytical techniques.

SBCCOM is the nation's leader in the development and fielding of state of the art microbiological detection devices. These devices, based on a wide variety of innovative technologies such as Polymerase Chain Reaction (PCR), must be tested to rigorous standards and must be conditionally verified using actual threat agents. Since the detection technologies are typically antibody

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REQUIREMENT: (Continued)
or DNA adjuncts, the testing protocols rely heavily on the use of killed pathogens. Gamma irradiation of live bacteria, rickettsiae and viruses can be used to render the threat organism harmless while still maintaining the antibodies and DNA required for testing. The proposed facility will be capable of bulk irradiation of live organisms to support the R&D biodetection effort. Irradiation requires a kiloCurie Cobalt-60 source which must be segregated from bench scale lab operations.

The secondary function of the new facility is to serve as the sole storage and operations center for the U.S. RDTE stocks of chemical warfare materiel. The facility will be required to accommodate storage of up to one metric ton of chemical agents. The agent must be segregated by type and will be stored in a variety of configurations. The facility is required to have a filtered ventilation system and be monitored by a continuous near real time, low-level agent detection system. Mission operations require laboratory space for small scale synthesis, distillation as well as aliquoting and preparation for shipments for permitted purposes under the CWC.

CURRENT SITUATION:
NEED TO ADD the intro for this sentence (appears to be missing)[] in the late 1970's and constructed in the early 1980's. This building is now obsolete and is experiencing serious structural deficiencies as noted below. Age problems for this facility include foundation settlement, structural deterioration, electrical limitations and outdated safety, health and environmental systems. In addition, the Maryland Department of Environment (MDE) has noted these deficiencies and has asked SBCCOM and the Army to make a good faith effort to mitigate these concerns. Problems with the sealed floor in the CTF have resulted in the potential for violations of Maryland hazardous waste regulations. Groundwater seepage has caused the floor to crack and the epoxy coating to be breached on several occasions. Numerous steps have been taken over the life of this facility to correct these floor sealing problems. The most recent attempt failed after an electro-osmotic pulse device was installed to repel groundwater.

Documented Safety and Health Issues for the CTF:

- Flooring does not meet standards (foundation is sinking, epoxy coating continuously cracks due to underground spring under foundation).

- Crowded lab space not compatible with current state of art equipment (re: power supply; filtered water; minimal lab bench space; fume hoods not sized to

accommodate equipment.)

-Fire suppression system ~~not up~~ antiquated and not in accordance with requirements to date (no sprinklers).

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CURRENT SITUATION: (CONTINUED)

- No airlocks into agent operating rooms
 - Wiring old and may not meet needs for state of art equipment
 - Back-up generator relays old; resulting in frequent failures.
 - Facility overheats in summer; personnel in laboratory wear shorts and suffer heat fatigue.
 - Electrical outlets located close to water sources; GFI's not installed.
 - Some ventilation systems not equipped with 2 filters and a redundant fan filter system (CHATS bulk agent transfer area).
 - Facility not designed for the receipt, handling or storage of explosives.
 - No separate, segregated area for real time chemical agent monitoring.
- Through innovative design and the efficient use of space, the proposed building will replace the loss of the CTF with improved safety, improved security, a higher level of environmental protection and significantly faster sample throughput for samples coming from DA, DoD, and other federal agencies.

IMPACT IF NOT PROVIDED:

If this project is not provided [redacted]. The threat from rogue nations, extremist groups and terrorist groups is growing. The WMD technology available to these groups has expanded exponentially in the last 10 years. In response to this very real threat, the intelligence community has significantly increased its technical and analytical efforts in chemical and biological warfare over the past 10 years because of this continuing threat. SBCCOM is at the forefront of the nation's efforts to protect US assets from chemical and biological weapons of mass destruction. SBCCOM's personnel and technical assets are fundamental to America's war on terrorism as demonstrated in the ongoing support to the Defense Intelligence Agency, other Defense organizations, the Department of Energy, the Central Intelligence Agency, and other federal agencies. Without this facility, less than optimal methods of handling toxic material will need to be employed. Failure of the current facility will result in unsafe storage of US RDTE chemical warfare stocks. Shutdown would impact the entire CB Defense and Demil programs.

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ADDITIONAL: Delete all the following and replace with the correct standard statements feature of this block in the DD Form 1391 processor.

The extremely low elevation relative to sea level makes the alternative of a retrofit of the existing facility impractical. Five years of disruptive attempts to rectify the water seepage problem, including a high technical attempt, have failed. Shut down of the facility's unique operation for eighteen months to two years to attempt another retrofit, of a more radical approach, is not an option in light of the facilities critical chemical agent mission. This project has been coordinated with the installation physical security plan, and all required physical security and/or combating terrorism (CBT/T) measures are included. This project complies with the US Army Corps of Engineers TI 800-01 Design Criteria.

NATO SECURITY INVESTMENT: NATO does not apply to this project. Remove this para (either deleting the spaces you put in this block or unchecking the appropriate box).

- E. CONCEPT COMPLETE DATE.....
 F. DESIGN COMPLETE-DATE.....
 G. TYPE OF DESIGN CONTRACT:
2. BASIS
 A. STANDARD OR DEFINITIVE DESIGN (YES/NO) N
 B. WHERE DESIGN WAS MOST RECENTLY USED:
3. COST (TOTAL \$000)
 A. PRODUCTION OF PLANS AND SPECS.....
 B. ALL OTHER DESIGN COST.....
 C. TOTAL DESIGN COST (C) = (A)+(B) OR (D)+(E)..
 D. CONTRACT.....
 E. IN HOUSE.....
4. CONSTRUCTION CONTRACT AWARD.....
5. CONSTRUCTION START DATE (PLANNED).....
6. CONSTRUCTION COMPLETION DATE.....

USACE CERTIFICATION:

Please resolve the following comments[]..

Change the estimate from Lump Sum (LS) to a breakout of cost items (i.e, square feet SF or square yards SY etc.,,,

Project scope is in compliance with Army standards, criteria and cost estimating requirements. Any deviations are justified. Sufficient information is available to commence concept design. The following issues should be resolved before budget submission to prevent project delay or loss: 1. Tab A - a. Estimate should be provided in terms of quantities and unit costs. b. Provide a line item for AT'FP under Primary Facilities (currently under the ADMIN facility roll-up c. In Description of Construction, say what AT/FP measures are—(done, comment should be removed) 2. Tab E - Provide costs for furniture and all OMA or OPA funded equipment. Items are there, looking for more??? 3. Tan G - a. Standard paragraph says above-minimum measures are required, but second paragraph barely describes minimum measures. Choose the appropriate standard statement from the standard statement feature of the additional paragraph b. DPW signature block is missing, and

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PLANNING AND DESIGN DATA (ESTIMATE)

USACE CERTIFICATION: (CONTD...)

there is no indication that the other 2 blocks have been signed (TAB is signed check the ATPF
 TAB G. 4. Tab J - a.
 Environmental analysis is inadequate; must be completely discussed and signed.
 b. Historic Preservation is inadequate; must be completely discussed. c.
 Provide section on Handicap Accessibility. d, Energy and Utility section is
 inadequate. Provide existing utilities, utilities needed for proposed project
 and the ability of the existing to meet the proposed need, or supporting work
 needed to provide it.

CERTIFIED BY: BG M. STEPHEN RHOADES
 Commander
 North Atlantic Division
 29 Mar 2002

This certification based on FY 2005.

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TAB C - QUANTITATIVE DATA

TYPE OF DESIGN: This facility includes unusual construction features that require extra design effort.

UNIT OF MEASURE: SF

A.	TOTAL REQUIREMENT	743,738	
B.	EXISTING SUBSTANDARD	133,605	
C.	EXISTING ADEQUATE	574,658	
D.	FUNDED, NOT INVENTORY	0	
E.	ADEQUATE ASSETS	574,658	
	/////////////////AUTHORIZED		FUNDED
F.	UNFUNDED PRIOR AUTHORIZATION	0	/////////////////
G.	INCLUDED IN FY PROGRAM	0	
H.	DEFICIENCY (A-E-F-G)	169,080	169,080

REMARKS:

RELATED PROJECTS:

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TAB C - GENERAL JUSTIFICATION DATA

GENERAL

Background:

The SBCCOM Edgewood Chemical Biological Center (ECBC) is a unique national asset that has hosted research efforts in the defense against chemical and biological weapons for over 85 years. In addition to advanced technological support to the war fighter, ECBC has led the U.S Domestic Preparedness Program since 1996, including the training of officials and responders in 105 cities. It remains a key partner in supporting domestic counter terrorism efforts. ECBC has traditionally supported the sample receipt and analysis mission for the CINCs and DoD intelligence organizations but has seen an increasing role and workload in domestic samples. ECBC operates highly specialized buildings, facilities and infrastructure that are required to safely handle supertoxic chemical and biological agents. Furthermore, these facilities require robust safety and environmental infrastructure to ensure that personnel, the local community and the environment are insulated from any mishap.

Although we have seen progress in both Chemical and Biological arms control, there remains a persistent and deadly threat to US military and civilian personnel because of the significant possibility of chemical and biological warfare. Underscoring the well documented threat from rogue nations is the growing threat from widely scattered terrorist and extremist groups. The WMD technology available to these groups has expanded exponentially in the last 10 years. In response to this very real threat, the intelligence community has significantly increased its technical and analytical efforts in chemical and biological warfare over the past 10 years because of this continuing threat. ECBC is at the forefront of the nation's efforts to protect US assets from chemical and biological weapons of mass destruction. ECBC's personnel and technical assets are fundamental to America's war on terrorism as demonstrated in the ongoing support to the Defense Intelligence Agency, other Defense organizations, the Department of Justice, the Federal Bureau of Investigation, the Department of Energy, the Central Intelligence Agency, and other federal agencies.

There is a core investment in infrastructure, facilities and personnel that is not readily found in the academic, commercial or industrial sector, as the cost and return for industry are small. Chemical warfare defense R&D that is conducted at universities and commercial laboratories throughout the country is dependent on the core efforts and the deep expertise at Edgewood. The majority

ADD sentence somewhere in this TAB. This project is in accordance with the installation master plan.

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TAB C - GENERAL JUSTIFICATION DATA

GENERAL (CONTD)..

of these activities utilize non-toxic and surrogate chemicals for R&D and proof of principle, but their efforts require the characterization efforts conducted at Edgewood. E.g., before implementation, methodologies and devices must be tested and validated with supertoxic chemical agents. Contractual chemical surety laboratories, which work with actual chemical agents, depend on Edgewood for working quantities of agents, standards, and procedures. None of the other national assets are equipped to address the full nature of the Edgewood mission or work with the super toxic lethal agents. There is an urgent need to establish a multi-functional facility that can address many of the nation's most pressing national security requirements. These requirements play a key role in maintaining and improving the nation's chemical and biological defense posture, to include Homeland Security. In addition, this facility will be instrumental in verifying evidence obtained during criminal investigations and to support National Command Authority decisions.

Mission:

- RECEIPT OF UNCHARACTERIZED SAMPLES (UNKNOWNNS)

One of the nation's most urgent requirements, especially in light of recent terrorist events, is the need for a new facility to receive, triage, sample and analyze "unknowns" coming from military theaters of operation, law enforcement agencies and intelligence organizations. These operations require engineering controls for the safe handling of samples, IEDs or RDDs which may contain lethal chemical agents, biological agents up to Biosafety Level III (BSL-3), biological toxins (mid-spectrum agents), radionuclides as well as potential energetic materials up to 0.5 lb TNT equivalent. A gamma irradiator is also required to effectively destroy any biological materials prior to shipment to other laboratory facilities for detailed analysis.

The nation currently has a single facility, the Chemical Transfer Facility (CTF) located at Edgewood, MD, which can triage, remotely access and concurrently sample / screen samples for military unique chemical agents, toxic chemicals, microbiologicals, biological toxins, radioactive materials and energetic/explosive materials.

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TAB C - GENERAL JUSTIFICATION DATA

GENERAL (CONTD)..

The new facility will consolidate these functions to handle, analyze and archive samples and will be capable of 24 hour, 365 day operations. The proposed facility will use existing chemical and biological sample handling/analysis technologies and will embrace new developments in high throughput sample analysis, such as use of robotic sample handling for large quantities of samples potentially contaminated with *Bacillus anthracis* (anthrax) spores and other biological agents. Robotic high throughput systems will allow the facility to cope with surges in unknown samples in a cost effective and safe manner while incorporating some of the latest analytical techniques.

- STORAGE OF LETHAL AND HAZARDOUS CHEMICALS

ECBC serves as the sole storage and operations center for the U.S. RDTE stocks of chemical warfare materiel. The facility will be required to accommodate storage of up to one metric ton of chemical agents. The agent must be segregated by type and will be stored in a variety of configurations. The facility is required to have a filtered ventilation system and be monitored by

a continuous near real time, low-level agent detection system. Mission operations require laboratory space for small scale synthesis, distillation as well as aliquoting and preparation for shipments for permitted purposes under the CWC.

The proposed facility will serve as the storage and operations facility for the U.S. RDTE stocks of chemical warfare materiel. The facility will be required to accommodate storage of up to one metric ton of chemical agents. The agent must be segregated by type and will be stored in a variety of configurations. The facility is required to have a filtered ventilation system and be monitored by a continuous real time, low-level chemical agent detection system. Mission operations require laboratory space for small-scale synthesis and distillation, as well as sample aliquoting and preparation for shipments for permitted purposes under the CWC.

- TREATMENT OF LETHAL AND HAZARDOUS CHEMICALS

The proposed facility will be operated under a Controlled Hazardous Substances Permit issued by the Maryland Department of the Environment (MDE)

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TAB C - GENERAL JUSTIFICATION DATA

GENERAL (CONTD)..

for the storage and treatment of hazardous materials. Typical permitted operations include detoxification of batches of chemical agents that are considered excess or off-spec. These wastes are typically residues generated by normal transfer, drill and drain of chemical filled munitions, packaging, purification and maintenance operations. Batches of agents are also detoxified under "Treatability Studies" permitted by the MDE. These destruction operations are also conducted in compliance with the provisions of the CWC.

The current facility (CTF) is the only facility in the country permitted for chemical treatment of various categories of hazardous wastes including chemical agents. Since waste chemical agents can not normally be sent directly to commercial hazardous waste facilities for treatment, it is necessary to maintain this capability to allow for storage and chemical treatment of small quantities of waste agent in accordance with State hazardous waste regulations prior to shipping the spent decontamination solution to a commercial facility for disposal.

The existing facility (Chemical Transfer Facility) is licensed by the State of Maryland for the storage and treatment of hazardous waste including agent and agent-related waste. It is the only facility in the country permitted for chemical treatment of a broad array of hazardous wastes including chemical agents. Since waste agents cannot be transferred to commercial facilities for treatment, it is necessary to maintain this capability to allow for storage and chemical treatment of small quantities of waste agent in accordance with State hazardous waste regulations prior to shipping the spent decontamination solution to a commercial facility for disposal.

- PURIFICATION OF CLASSICAL WARFARE AGENTS

The US effort to protect the nation and our allies from the threat of chemical agents requires a robust and aggressive R&D program. ECBC's R&D in this area, along with the collaboration with our partners in government, academia and industry, require that ECBC provide a consistent and high quality supply of classical chemical agents. Quantities of chemical agents are drawn from bulk containers (such as ton containers) and must be purified by distillation to ensure the quality of the product provided to the research community. This purification process is inherently hazardous, requires

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TAB C - GENERAL JUSTIFICATION DATA

GENERAL (CONTD)..

manipulation of bulk quantities of lethal agents, and must be segregated from lab scale operations which use small quantities of these supertoxic chemicals.

- DESTRUCTIVE AND NON-DESTRUCTIVE EVALUATION OF DEVICES / MUNITIONS

The intelligence and law enforcement community relies heavily on ECBC to receive, evaluate, sample and analyze devices and munitions. As an example, home made devices identified in a crime scene scenario are often constructed using pressurized vessels, sealed containers or other improvised construction. Standard field protocols for sample extraction become impossible and require a sophisticated and multi layered approach to the evaluation process. The ECBC has the capability to use non-destructive technologies such as industrial x-ra equipment and neutron activation equipment (PINS). In addition, ECBC can perform destructive evaluations such as remote drilling of containers, controlled explosives detonation, and controlled pressure regulation. The proposed facility will expand on current CTF remote drilling operations to include the capability to evaluate and sample devices with a TNT equivalent of 0.5 lbs. The facility will be capable of safely removing chemical, biological radioactive or energetic/explosive materials from improvised devices and munitions.

- IRRADIATION OF MICROBIOLOGICAL SAMPLES

The ECBC is the nation's leader in the development and fielding of state of the art microbiological detection devices. These devices, based on a wide variety of innovative technologies such as Polymerase Chain Reaction (PCR), must be tested to rigorous standards and must be conditionally verified using actual threat agents. Since the detection technologies are typically antibody or DNA adjuncts, the testing protocols rely heavily on the use of killed pathogens. Gamma irradiation of live bacteria, rickettsiae and viruses can be used to render the threat organism harmless while still maintaining the antibodies and DNA required for testing. The proposed facility will be capable of bulk irradiation of live organisms to support the R&D biodetection effort. Irradiation requires a kiloCurie Cobalt-60 source which must be segregated from bench scale lab operations.

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TAB C - GENERAL JUSTIFICATION DATA

GENERAL (CONTD)..

- CASARM REPOSITORY

The proposed facility will produce, store and maintain the U.S. Chemical Agent Standard Analytical Reference Materiel (CASARM) repository. CASARM is ultra-pure agent certified for use as standard analytical reference material. It is used for RDTE activities permitted by the CWC, including production of calibration standards for all equipment used for agent analysis and monitoring

TRAFFIC ANALYSIS (STANDARD TEXT)

A Traffic Analysis does not apply to this project.

ANALYSIS OF DEFICIENCIES

The current facility, the Chemical Transfer Facility (CTF), was designed in the late 1970's and constructed in the early 1980's. This building is now obsolete and is experiencing serious structural deficiencies as noted below. Age problems for this facility include foundation settlement, structural deterioration, electrical limitations and outdated safety, health and environmental systems. In addition, the Maryland Department of Environment (MDE) has noted these deficiencies and has asked ECBC to make a good faith

effort to mitigate these concerns.

Structural

Problems with the floor in the CTF have resulted in the potential for violations of Maryland hazardous waste regulations. Groundwater seepage has caused the floor to crack and the epoxy coating to be breached on several occasions. The ECBC has taken numerous steps over the life of this facility to correct these floor sealing problems. The most recent attempt failed after an electro-osmotic pulse device was installed to repel groundwater. The failure resulted in floor rupture in several places due to the buildup of pressure under the floor. Maryland's hazardous waste regulations require that areas where hazardous waste is stored in containers or treated in tanks have a

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TAB C - GENERAL JUSTIFICATION DATA

ANALYSIS OF DEFICIENCIES (CONTD)..

underlying base which is free of cracks or gaps and is sufficiently impervious to contain leaks and spills.

Ruptures in the floor in any of the permitted rooms or the tank farm will result in a violation of hazardous waste regulations and could lead to fines. In the worst case the hazardous waste treatment and storage permit could be revoked. This would jeopardize the chemical agent mission of the U.S Army Chemical and Biological Center since there would be no capacity for storage or treatment of waste chemical agents. Several experts have examined the problem with groundwater seepage at the CTF and the best technology has failed to produce a solution. The CTF facility is rapidly reaching the end of its life due to irreversible and persistent structural deterioration.

State hazardous waste regulations include specific requirements for tank systems in which hazardous waste is stored or treated. The tank system at the CTF was not originally designed to meet these hazardous waste requirements and as a result, has required numerous upgrades and modifications over the years. The current tank system is in compliance with state regulations but it is not ideally suited for the management of hazardous waste. The new facility would be designed specifically for management of hazardous waste. This would reduce the likelihood of needing modifications in the future to meet changing hazardous waste requirements.

Electrical

The electrical power capacity in the CTF is saturated. The cost of installing more electrical power is approximately \$1M. No new equipment can be installed without reducing the load by turning off existing equipment. High-sensitivity analytical equipment is very sensitive to power fluctuations and the lack of clean-power affects data collection efforts.

Monitoring

The current facility utilizes real time chemical agent monitors (MINICAMS) in the same area as chemical agent operations. A mishap in the operating area will make it impossible for technicians to calibrate and service the monitorin

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ANALYSIS OF DEFICIENCIES (CONTD)..

systems in the contaminated area. The proposed facility will utilize an agent monitoring area segregated from the agent operational area, thus ensuring the highest degree of worker safety and equipment longevity.

Segregation of Lethal Agent Operations

The CTF does not have airlocks for entry into potentially contaminated areas. Currently personnel have to perform first entry monitoring in Level A protection to enter potentially contaminated rooms. Airlocks to biological and chemical agent operational areas will ensure that contaminants can not migrate to clean areas in the facility.

Environmental Controls

Temperature control in the CTF is inadequate. There are days when operation must be curtailed due to extremely high heat stress to workers who must handle/move ton containers and other heavy items. At times, the temperature excursions make it impossible to work because computer and electronic systems shut down at high temperatures.

Documented Safety and Health Issues for the CTF:

- Flooring does not meet standards (foundation is sinking, epoxy coating continuously cracks due to underground spring under foundation).

- Crowded lab space not compatible with current state of art equipment (re: power supply; filtered water; minimal lab bench space; fume hoods not sized to accommodate equipment).

- Fire system not up to date (no sprinklers).

- No airlocks into agent operating rooms

- Wiring old and may not meet needs for state of art equipment.

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TAB C - GENERAL JUSTIFICATION DATA

ANALYSIS OF DEFICIENCIES (CONTD)..

- Back-up generator relays old; resulting in frequent failures.
- Facility overheats in summer; personnel in laboratory wear shorts and suffer heat fatigue.
- Electrical outlets located close to water sources; GFI's not installed.
- Some ventilation systems not equipped with 2 filters and a redundant fan filter system (CHATS bulk agent transfer area).
- Facility not designed for the receipt, handling or storage of explosives.
- No separate, segregated area for real time chemical agent monitoring.

CRITERIA FOR PROPOSED CONSTRUCTION

CRITERIA FOR PROPOSED CONSTRUCTION

This project will be designed and constructed according to all applicable Corp of Engineers design standards.

A partial list of applicable standards: TM5-853-1,2,3, and 4, ERDEC Safety Engineering Handbook for Facility Acquisition, TM5-855-1, TM5-1300, AR 50-6, T 800-1, NFPA 101, MIL HDBK 1008-C, APG Real Property Master Plan (Installation Design Guide).

The building shall have a METASYS Facility Management System that is manufactured by Johnson Controls, Inc. The FMS shall supervise, monitor, and

control all HVAC, lighting, security, and fire protection systems. The FMS shall communicate back to the DPW Shops located in Building E-5126. The FMS and HVAC systems shall be flexible enough to change operating schemes from 100 outside air with no recirculation to normal office environmental control.

The building shall conform with all 'SMART BUILDING' criteria as defined by CERL. Inasmuch as technologically possible, different control systems shall have the capability of communicating with one another. Building shall have a

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CRITERIA FOR PROPOSED CONSTRUCTION (CONTD)..

'smart roof' with automatic leak detection capability. Designer shall differentiate laboratories that require 100% makeup air from those that do not and design accordingly to reduce energy consumption. Designer will coordinate with proponent to determine the feasibility of variable face velocity of fume hoods during idle situations.

The building will have an area which is hardened to allow overpressure resulting from the potential detonation of 0.5 lb TNT equivalent. This area will have an independent exhaust and makeup air filtration system which can withstand the overpressure as described above.

SPACE REQUIREMENTS ANALYSIS

Based on interviews with ECBC personnel, the following laboratory, chemical plant and administrative requirements were identified:

1. Laboratory Space

Laboratory	SF
-----	---
Chem Purification	1288
Waste Decon & Proc	700
Microbiology Lab	1612
Lab SF	3600
Lab Support @20%	720
Lab Module Var. @8%	288
TOTAL LAB SF	4608

2. Chemical Plant / Chemical Storage Space

General Storage	1500
Agent Storage	3500
Agent Storage, Cold	750
Agent Transfer	2500

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CRITERIA FOR PROPOSED CONSTRUCTION (CONTD)..

Explosives Handling	1500
Unknown Receipt/Triage	2900
Control Room	750
Agent monitoring room	500

TOTAL PLANT/STORAGE SF 13,900 NSF

3. Administrative Space

Total Persons - 12

Total SF Req 1,500 SF

Special Use Space:

Classified Conference 600 SF

Total Admin Space: 2,100 SF

TOTAL FACILITY 20,608 GSF

Installation Engineer: Tim Blades
Phone Number: 410-436-4675

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TAB C - MACOM CERTIFICATION

"All planning and coordination with appropriate agencies has been accomplished and project documentation is available. The project is valid, requirements and scope are in accordance with HQDA guidance and siting is in accordance with the MACOM approved Installation Real Property Master Plan. No major problems exist that should defer the project from programming. The project documentation has been reviewed by USACE and found adequate to begin design."

CERTIFIED BY: Christopher J. Young
DCS for Installations
HQ, U.S. Army Materiel Command
18 Mar 2002

This certification based on FY 2005.

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TAB D - ECONOMIC ANALYSIS DATA

ECONOMIC JUSTIFICATION SUMMARY

ADD OBJECTIVE: Provide Chemical, biological and radiological (CBR) sample receiving and processing capability for the Edgewood Chemical Biological Center (ECBC)

~~New Construction is the only viable alternative to meet this requirement.~~

Alternatives considered:

1. Renovate Existing Facility

This would involve renovating the existing Chemical Transfer Facility (CTF) to meet all current mission and regulatory requirements. In order to do this, the floor of the facility would have to be demolished and the existing underground storage tanks would have to be removed and disposed of. This is a CERCLA action and would involve 18-24 months of review and approval by DA and the State of Maryland prior to removal, rendering the facility inoperable during the renovation. However, there is no other facility at APG in which the mission can be performed temporarily, therefore the facility must remain in

operation during the renovation. Since the facility cannot be renovated without the tank removal, and the removal would result in an untenable mission impact due to the delay in approval, renovating the existing facility is not a viable alternative.

2. Renovate Another Existing Facility

This would involve locating another similarly constructed facility and renovating it to be the new Chemical Transfer Facility. This mission is very location sensitive. It must be located close to existing chemical surety laboratories. There are no facilities available for renovation in the chemical surety laboratory area, or within close proximity to them.

3. New Construction

This would involve construction of a new Chemical Transfer Facility within close proximity to the existing chemical surety laboratories. There is adequate land and utility support to construct the new facility in the required location.

Add the following alternatives and discuss/dismiss[]..

4. Lease

5. Use other DOD facilities

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TAB E - FURNISHINGS AND EQUIPMENT

FURNISHINGS AND EQUIPMENT

LINE	DESCRIPTION	TOTAL COST	PROC APPR FY	PROC APPR
1)	CHATS Glove Box	500	2007	OPA
2)	Modular Furniture and Equipment	150	2007	RDT&E
3)	Analytical Equipment	400	2007	RDT&E
4)	Explosion Proof Refrigeration	75	2007	RDT&E

LINE	EST. DELIVERY DATE	PROC STATUS	EST. INSTL COST	INSTL FY	INSTL APPR
1)	(CONT'D)	01/2007	0	0000	
2)	(CONT'D)	01/2007	0	0000	
3)	(CONT'D)	01/2007	0	0000	
4)	(CONT'D)	01/2007	0	0000	

INFORMATION SYSTEMS FURNISHINGS AND EQUIPMENT

LINE	DESCRIPTION	TOTAL COST	PROC APPR FY	PROC APPR
1)	Info Sys - ISC	13	0000	OPA
2)	Info Sys - PROP	4	0000	RDT&E

LINE	EST. DELIVERY DATE	PROC STATUS	EST. INSTL COST	INSTL FY	INSTL APPR
1)	(CONT'D)		0	0000	
2)	(CONT'D)		0	0000	

List the calculations of the OMA furnishings (i.e., quantity of people times \$\$\$ per person/workstations. Discuss any other unique furnishings, etc.

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TAB E - FURNISHINGS AND EQUIPMENT

INFORMATION SYSTEMS FURNISHINGS AND EQUIPMENT (CONTD..)

TOTALS BY APPROPRIATION TYPE:
TOTAL OMA/OMN/3400/OM DHP: 0
INSTALLED EQUIPMENT - OTHER APPROPRIATIONS: 1,142
TOTAL RELATED FURNITURE & EQUIPMENT AMOUNT: 1,142

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE):

INSTALLATION - Aberdeen Proving Ground YEAR - 2005 FNO - 52093
PROGRAM TYPE - MCA PROJECT NO. - 52093
USACE DISTRICT - NAB MACOM - AMC
PROJECT TITLE - Chemical, Biological and Radiologic
PRIMARY PROPONENT FUND TYPE - RDT&E CONTGY FACTOR - 5.00
CAF FACTOR - 14.00

SECTION I. PRIMARY FACILITY, INSIDE THE 5 FOOT LINE -
INSTALLED EQUIPMENT (SEE AR 415-15, APPENDIX L)

DESCRIPTION	UM	QUANTITY	UNIT PRICE	TOTAL COST	F T
1) BACKBOARD 4' X 8' X 3/4"	EA	1	51.16	51	C
2) DATA: EQUIPMENT CABINET 19"	EA	1	2442.89	2443	C
3) EMT(2) 1" W/ HARDWARE	LF	5700	4.16	23712	C
4) CABLE TRAY (6" WIDE)	LF	125	15.60	1950	C
TOTAL				28156	

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE): (CONTD)..

SECTION II. PRIMARY FACILITY, INSIDE THE 5 FOOT LINE -
EQUIPMENT IN PLACE (SEE AR 415-15, APPENDIX L)

DESCRIPTION	UM	QUANTITY	UNIT PRICE	TOTAL COST	F T
1) PHONE: 2500 TYPE	EA	10	58.21	582	I

2) PHONE: EXPLOSION-PROOF	EA	6	1615.23	9691 I
3) OUTLET: DUAL RJ45	EA	20	39.75	795 C
4) OUTLET: SINGLE RJ45	EA	11	28.77	316 C
5) PATCH PNL, RJ45 CAT 5, 24 PORT	EA	1	138.70	139 C
6) PATCH CORD: RJ45 CAT 5, 7 FT	EA	10	5.31	53 C
7) PATCH CORD: RJ45 CAT 5, 15 FT	EA	10	7.64	76 C
8) BLOCK: 66 TYPE, 50 PR 3 CLIP	EA	4	101.41	406 C
9) FO ST CONNECTOR MM INSTALLED	EA	12	58.35	700 C
10) FO ST CONNECTOR SM INSTALLED	EA	12	94.31	1132 C
11) STA CBL: CAT 5 UTP (4 PR)	LF	10500	.76	7980 C
12) PROTECTED TERMINAL: 50 PR	EA	1	750.33	750 C
13) FO ST PATCH PNL 12 MM W/CPLRS	EA	1	263.97	264 C
14) FO ST PATCH PNL 12 SM W/CPLRS	EA	1	263.97	264 C
15) DATA: UNINTERRUPT PWR SYST (UP KVA		1	2938.77	2939 P
16) 5.00% Contgy Factor	LS	0	.00	514 I
17) 5.00% Contgy Factor	LS	0	.00	147 P
18) 14.00% CAF	LS	0	.00	1438 I
19) 14.00% CAF	LS	0	.00	411 P
			TOTAL	28597

PRIMARY FACILITY NOTES:

Approximately [____10] personnel will ultimately require telephone service in this facility; immediate requirement for telephone service is for [__10__] personnel. [LAN system is required as follows: [--specify LAN hub requirements by service type [10Base-T, 10Base-F, FDDI, FDDI Bridge, etc.] and LAN network interface requirements by type--____]. [A requirement for fiber optic LAN connectivity has been identified for [__10__] personnel. [A standard outlet density of one outlet per 80 square feet is required in this facility.] [A

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE): (CONTD)..

modified outlet density of one outlet per [____] square feet is required in this facility.] [__15__] new telephone sets are required. [[__6__] special feature telephone sets, [__explosion proof__], are required. CATV/CCTV requirements include: [__--specify CATV/CCTV requirements--__]. Special requirements include: [__EMT is required for all station cabling attached to explosion proof phones. Communications backboard is to be treated with fire retardant paint.__]

SECTION III. SUPPORTING FACILITIES, OUTSIDE THE 5 FOOT LINE -
INSTALLED EQUIPMENT (SEE AR 415-15, APPENDIX L)

DESCRIPTION	UM	QUANTITY	UNIT PRICE	TOTAL COST	F T
1) GIP 4" 2 WAY BORING/PUSHING	LF	75	50.78	3809 C	
2) HANDHOLE PRECAST 4'X4'X4'	EA	2	2446.94	4894 C	
3) UNDERGRND DUCT 2 WAY	LF	2500	4.67	11675 C	
4) TRENCH BACKHOE 24"X 30"	LF	2500	6.20	15500 C	
			TOTAL	35878	

SECTION IV. SUPPORTING FACILITIES, OUTSIDE THE 5 FOOT LINE -
EQUIPMENT IN PLACE (SEE AR 415-15, APPENDIX L)

DESCRIPTION	UM	QUANTITY	UNIT PRICE	TOTAL COST	F T
1) CABLE UNDERGRND: 50 PR, 24 A LF	LF	2500	1.20	3000 C	
2) FOC-SM, UNDERGRND: 12 STRANDS	LF	2500	2.24	5600 C	
3) FOC-MM, UNDERGRND: 12 STRANDS	LF	2500	3.75	9375 C	
4) CABLE UNDERGRND PAIRS SPLICED	EA	100	.92	92 C	
5) CABLE UNDERGRND SPLICE CASE	EA	2	439.50	879 C	

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE): (CONTD)..

TOTAL 18946

SUPPORTING FACILITIES NOTES:

Telephone cable service can be had [2500] feet from the project site at location: [Bldg. 3461]. Fiber optic LAN/WAN cable service can be had [2500] feet from the project site at location: [Bldg. 3461]. [New copper cable(s) will be required as follows: [2500 feet of 50 pair 24 quage].] [New fiber optic cable(s) will be required as follows: [2500 feet of both single and multimode fiber; 12 strands each. [[2] manhole(s) are required; buried duct is required as follows: 5000 linear feet of 4' rigid pvc to accomodate 2- 2500 foot runs from bldg. 3461 to new facility.].] Special requirements include: [-- specify special requirements--].

INFORMATION SYSTEMS COST SUMMARY:

	CONF	ISC	PROP	TOTAL
PRIMARY FACILITY	41031	12225	3497	56753
5% SMALL ORDER COST (P)	2052	611	175	2838
SUPPORTING FACILITIES	54824	0	0	54824
5% SMALL ORDER COST (S)	2741	0	0	2741
TOTAL	100648	12836	3672	117156

REMARKS: Fill in the empty blocks below as appropriate

This project is associated with MCA Project Number: []. The outside plant in this projects also supports requirements associated with MCA Project Number: []. [Local agreements require that the government provide [--specify any local agreement that impact the information system, i.e.: government provide access to outside plant manhole and duct system for commercial telephone and/or CATV service; government does/does not provide cable barracks telephone/CATV outlets; etc.]. Special requirements include: [-- specify special requirements--].

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TAB F - INFORMATION SYSTEMS COST ESTIMATE (ISCE): (CONTD)..

/S/ C. Byrne Huntley 03/19/2002
 Director, Info Mgmt
 DOIM

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 LAF=.89 UM=E
 DATE 02 DEC 1998 FY 2005 PROGRAM
 PROJECT NUMBER: 52093
 PROJECT TITLE: Chemical, Biological and Radiological (CBR) Sample Receiving Facility
 INSTALLATION: Aberdeen Proving Ground
 LOCATION: Maryland

TAB G - ANTITERRORISM/FORCE PROTECTION REQUIREMENTS DATA WITH SIGNATURES

ANTITERRORISM/FORCE PROTECTION (STANDARD TEXT)

This project has been coordinated with the installation antiterrorism/force protection plan. Risk and threat analyses have

been performed in accordance with DA PAM 190-51 and TM 5-853-1, respectively. Protective measures required by regulation and additional protective measures, above the minimum required by the current Department of Defense Minimum Antiterrorism Standards for Buildings, are needed to mitigate the threat. These requirements are included in the description of construction and cost estimate.

SUMMARY OF RISK AND THREAT ANALYSES AND DESCRIPTION OF ANY PROTECTIVE MEASURES THAT ARE REQUIRED.

Based on the nature of the mission performed in this facility, the following AT/FP construction measures are required: mylar on all windows, standoff from parking, entry control facility, double security fence with intrusion detection system surrounding the facility, and passive vehicle barrier surrounding the fence.

REQUIRED SIGNATURES:

PROVOST MARSHAL

Show all signatures as signed. ADD the DPW Signature block.

Robert W. Krauer
GS-13
Provost Marshal

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TAB G - ANTITERRORISM/FORCE PROTECTION REQUIREMENTS DATA WITH SIGNATURES

REQUIRED SIGNATURES: (CONTD)

FORCE PROTECTION OFFICER

Robert W. Krauer
GS-13
Provost Marshal

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TAB H - PRESENT ACCOMMODATIONS AND DISPOSITIONS

ACCOMMODATIONS NOW IN USE AND DEMOLITIONS

ARLOC	INSTALLATION	BLDG NO	PRES CAT	T C	TOTAL QTY	UM	AREA OCPD	D PLAN S CAT F CODE
1)	24004 Aberdeen Provi	E3832	31010	P	13,000	SF	13,000	R 31010
FOOTNOTES:								
Mothballed								
2)	24004 Aberdeen Provi	3508	44220	T	10,944	SF		0 D
3)	24004 Aberdeen Provi	3514	21885	T	10,944	SF		0 D

TOTAL NUMBER OF BUILDINGS TO DEMOLISH = 2
TOTAL NUMBER OF BUILDINGS TO RETAIN = 1
TOTAL AREA OF BUILDINGS TO DEMOLISH = 21,888 SF
TOTAL AREA OF BUILDINGS TO RETAIN = 13,000 SF

PRESENT ACCOMMODATIONS AND DISPOSITIONS

Existing facility is contaminated and will be mothballed after the new facility is constructed. One for one demolition consists of existing temporary space awaiting demolition funds.

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TAB J - ENVIRONMENTAL ANALYSIS

ENVIRONMENTAL DOCUMENTATION

An Environmental Assessment (EA) is required for this project and will be prepared in the coming months. It will tier off the existing RCRA permit for the CTF operation.

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TAB J - PROTECTION OF HISTORIC PROPERTIES

HISTORIC AND ARCHEOLOGICAL SITES (STANDARD TEXT)

This project has been evaluated for impact on historic and archeological property and complies with the National Historic Preservation Act (PL 89-665), as amended, and EO 11593.

DETAILED STATEMENT OF REVIEW FINDINGS

This project does not involve or impact any historic or historically significant projects.

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TAB J - EVALUATION OF FLOOD HAZARDS AND ENCROACHMENT ON WETLANDS

EVALUATION OF FLOOD HAZARDS (STANDARD TEXT)

This project is not sited in a floodplain or wetlands.

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TAB J - PROVISIONS FOR THE HANDICAPPED

PROVISION FOR THE HANDICAPPED (STANDARD TEXT)

The physically handicapped will be provided for (PL 90-480).

The estimated count of civilian employees and civilian users
is 15.

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TAB J - COMMERCIAL ACTIVITIES

CA ANALYSIS CONCLUSIONS

This project is not subject to commercial activities study.

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TAB J - ENERGY AND UTILITY REQUIREMENTS

SUMMARY OF ENERGY REQUIREMENTS

Due to the selection of more efficient filters and mechanical systems, this facility will result in an overall reduction in energy usage.
COE requests a better discussion of this para. Could utilize

Appendix G: Comments on DD Form 1391 and Cost Estimate Details

Comments

1. Sect. 1.2, paragraph 2: "... provide an adequate, modern, and consolidated administrative facility"

While the statement appears precise and descriptive at first, the terms adequate, modern, and consolidated are actually rather vague and interpretable. Some would suggest that "modern" deals specifically with an architectural ideology and aesthetic. Others would imply that it relates specifically to the level of high-tech equipment and furnishings to be installed. "Adequate" is similarly ambiguous, as what may be adequate for administrative support may not be adequate for a colonel. Finally, "consolidated," to a sustainability expert, implies a minimized facility, using the least amount of space, and providing for intelligent spatial arrangements and solutions for the most efficient building possible.

2. Sect. 1.2, paragraph 2: "The building will serve as a prototype, which will display a range of design features that could be tested and then adapted to future Army SDD projects."

In this case, if the building is to function as a teaching tool, the scope of features must be considerably more intense. Currently, the most radical proposal for the project is the ground source cooling system. Other items, such as materials and roofing systems really create no new solutions, nor do they instigate other installations to push the envelope of sustainability.

3. Sect. 2.1, paragraph 2: "Future personnel count was anticipated to be 300 persons. The allowable gross building size ... was determined to be 55,000 gross square feet."

If the personnel count is 300 persons, why is the number "450 persons" found in multiple locations throughout the planning documentation and Form DD 1391? One of the chief goals of building sustainably is to build no

more than what is actually necessary (with attention paid to future uses, of course). This change in number of persons directly corresponds to the change (+74%) in the building's gross area. Please make sure the 1391 is consistent.

4. Sect. 2.2.2, paragraph 4: "Based on the provided information and using Army space criteria, a building allowance of 95,500 GSF was calculated ..."

The provided information one page earlier in the documented showed that 55,000 GSF was required. Does this increase in space accommodate the auditorium, training areas and cafeteria that are proposed? If the Army space criteria are overestimating need, they should be overlooked. Minimum guidelines are not always the best answer. If space criteria are in opposition to real needs, they should be brought under investigative review, not accepted as infallible.

5. Fig. 2: 450 people

How was this number generated? What is creating a need for 50% more capacity? Other numbers do look reasonable, however. After re-evaluating the need for 450 people in the building, many other associated numbers will be reduced proportionately.

6. Fig. 2: Cafeteria/Lunchroom size data

20 GSF/person is allocated for the space and Architectural Graphic Standards (9th ed.) is cited for the data. Consulting the 10th ed. (pg. 881) of the same reference, it is shown that cafeterias should be sized at approximately 12-18 GSF/person. Please consider reducing the space allowances for the cafeteria/lunchroom.

7. Sect. 2.2.2, paragraph 5: "Potential future expansion may be accommodated on the approximately 20-acre site, which provides adequate area for the construction of additional buildings to create a campus-type atmosphere."

How will this proposed "atmosphere" be created without some type of master plan? As it stands, the area surrounding the building is nearly rural/wilderness. To suggest that it will one day become an organized, walkable, "urban" environment is implausible without first analyzing what might one day be built there. This is a considerable portion of land, and should not be left unplanned! This plan should incorporate bike and pedestrian paths to other places on the installation that people want to go to.

8. Sect. 2.2.2, paragraph: “The conceptual nature of the proposal is stressed, as the project is not fixed to this design or site.”

Given the nature of the 1391 process, it is understood that the building’s development is rather conceptual at this point. However, in a truly sustainable solution, the building and its program are inherently tied to the site. For instance, if a building needs water for its operations, any selected site should require the presence of a natural source of water. In this particular case, important aspects of the building are connections with power, Internet, and roads, and access by the building occupants and users; is the selected site the best given these parameters?

9. Sect. 2.2.2, list item: “Primary heating provided by existing base steam loop.”

The reasons for connection to existing steam heat is clear (costs, simplicity, reliability, capacity). However, the \$340k allocated for the steam connection could be used to outfit the ground source cooling system for heating capabilities. Currently, it has only been slated for use in cooling; why not increase the scope to allow for heating as well? The system is already going to be in place. Additionally, the future lifespan of the steam system should be considered. If the steam plant is removed, what happens to the administration building’s heat supply? At that time, more funds would need to be allocated to retrofit the ground source system for heating (or simply install boilers in the building)—funds that could simply be allocated now.

10. Sect. 2.2.2, list item: “Only excess rainwater that exceeds projected reuse is discharged into the site storm sewer system.”

This is completely unnecessary. A detention basin and bioswale would be so simple to incorporate on this ample site. It should be a “must have” item. Interestingly, this seems to be the aim of a later-occurring list item (3-4 other items are repeated as well ... please edit).

11. Sect. 2.2.2, list item: “Lobby entrance featuring a glass curtain wall to bring natural light into the center of the building.”

Lighting must be carefully analyzed in further design investigations. Simply providing glass does nothing to ensure the penetration of illumination into a space. Light shelves and reflective surfaces may be needed to provide effective daylighting to as many occupants as possible.

12. Sect. 2.2.2, cost estimation: “... This total is then multiplied by the area cost factor. It also incorporates an average construction cost for LEED™ certified pro-

jects from the HOK guidebook ... from which the MCA cost is subtracted to give us a target square foot cost for the LEED™ portion.”

First of all, Sustainable Design and Development should never be viewed as a separate entity (inferred by the phrase: “LEED™ portion”). Attempting to follow the math, some very fuzzy details emerge. After arriving at the basic MCA cost (\$135.72/sf) for this facility, some cost factors are added (33% to account for soft costs = \$180.51/sf), and then followed by a 10% reduction (to \$162.46/sf) in cost due to location. The following part of the matrix is where things get really fuzzy—the average LEED™ value (\$200.00/sf) is compared to the original cost (\$135.72/sf). This difference (\$64.28/sf) is then added to the adjusted cost to arrive at a new total of \$226.74/sf. The only part that makes sense is the final calculation that adds simple interest to inflate the cost to FY2006, arriving at \$275.60/sf. Basically, this math says that the Army can’t do a sustainable building for the cost that HOK has averaged. CERL would like to offer a challenge and suggest that not only can the Army do a great sustainable building, but it can do it for a competitive price!! (Note: We acknowledge it is hard to do a good cost estimate for a Platinum SPiRiT/LEED™ building using the currently available cost estimating tools. Using the HOK experience or USGBC examples may be a good way to identify project costs for comparable buildings. The Army is a member of the USGBC, and this project team should have access to the Members Only portion of the USGBC website (<http://www.usgbc.org>). CERL can tell you the password to register as an Army user. Ask Rich Schneider or Stumpf Stumpf for details).

13. Sect. 3.1.4, paragraph 1: “The construction of the parking lot will require the removal of approximately 2 1/2 acres of mature trees.”

Surely we can design a building/parking lot that would allow the trees to remain. The document states that 8 acres remain open for construction. Even with 95,500 sf of area taken up by a building (which it does not, as the footprint is smaller), 252,980 sf (5.8 acres) remains to be filled with parking. Additionally, leaving the trees alone could save \$148k for the project (see supporting cost estimate documentation). (Consider getting an aerial photo of the site and using it to plan the building and parking locations).

If the trees are cut down, what is going to be done with all the wood? It would be good to use the wood in another project, or sell it to the private sector. This needs to be planned in advance so the builder follows through.

14. Sect. 3.2.5, paragraph 1: "... the main communications equipment room shall remain operational at all times and was provided with dedicated HVAC service connected to backup power ..."

It is a fact that this equipment generates heat and it must remain operational in a power outage, hence the UPS equipment provided for this scenario. However, CERL would like to know the anticipated capacity of the UPS (how many hours will systems remain online?) and the anticipated time it would take for the room and systems to overheat (since this is the need for the HVAC backup). If the batteries run out before the servers/switches overheat, there is no need for the HVAC system. Additionally, the average outage duration should be investigated. If the typical outage is, perhaps, 2 hours, what will happen to the critical equipment if it were not cooled for that amount of time? Perhaps the backup power source can be minimized.

15. Sect. 3.2.7, paragraph 1: "... steam-to-steam humidifier for gross humidity control within the building. Individual room control was not provided."

This is problematic simply for the fact that if temperature can be adjusted, humidity is adjusted along with it. Temperature and humidity are interrelated. If the temperature is increased, relative humidity drops. Likewise, if temperature goes down, relative humidity goes up. If you simply control humidity from one point in the whole building, you may not be able to provide adequate humidity control throughout the building. Are there spaces in the building where local humidity control would be essential?

16. Sect. 3.3.5, paragraph 1: "Parking lot lighting will consist of high cut off ..."

Perhaps it would be wise to be a bit more descriptive about the cut off pattern of the exterior lighting. This wording allows for various interpretations. There are also options for solar and hybrid wind/solar streetlights.

17. Sect. 3.3.7 - Renewable Energy

What happened to biomass, biogas, wind, and geothermal?

18. Sect. 3.3.7.1 - Photovoltaic Power

While the investigation into PV was positive, CERL feels that the scope was perhaps narrow and brief. Conversations with Spire Solar revealed costs nearing \$10/watt for the installation (vs. the \$8/watt the report showed). However, there are other options for solar power besides simple panels. One example would be the "Power Roof" by Duke Solar. This system, while

equally expensive, actually forms the roof of the building, and performs triple duty of creating hot water, cooling capacity, and electric power. Further information can be seen at the Duke Solar website:

<http://www.dukesolar.com/prod/Company/Division/Buildings/>

19. Sect. 3.3.7.2 - Fuel Cell

There was no mention made to the advantages of being off-grid. Fuel cells, and their capacity for distributed generation is a significant gain, even though they are expensive. Perhaps a fuel cell could be used to generate power for storage in batteries that could provide power at peak times, reducing load on the existing grid. (CERL is providing the analysis for this aspect of the project, but we haven't seen it yet).

20. Sect. 3.4 - Architectural

The level of involvement in the architectural features at this point is rather refreshing, however, CERL questions the reason for not proposing the reuse of the entire existing concrete pad and superstructure. Recycling the building is a great idea; why not push it further? Is there a substantive reason as to why the building's footprint is inappropriate for an administration facility? Building reuse and reconfiguration should be a viable alternative.

21. Form DD 1391 - general comments & questions

Working back from \$258.55/sf (FY2006 dollars) as printed at a compounding rate of 5%, it can be determined that this building is going to be constructed for \$192.93/sf (FY2000 dollars). This is in line with HOK's average values, and should be commended. However, the value escalates from there. Is the Contingency Percent (10.0%) reasonable? The soft costs should already be accounted for. In an effort to see more sustainable buildings get built, CERL would like to see the cost minimized as much as possible.

There is no mention of a bioswale in the 1391. CERL feels this would be an appropriate addition for stormwater purification.

22. Cost Estimate Detail - general comments & questions

Investigating the expanded version of the cost estimate, two items draw attention: solar power, and tack boards.

It seems clear from reading the Planning Report that the decision was made to only provide a couple of solar panels for demonstration purposes. How-

ever, in the cost estimate, \$2.2M is set aside for solar technologies. Oversight, perhaps?

The document calls out nearly 92,000 sf for tack boards. CERL performed a cursory investigation into tack boards and found them to generally be found in sizes ranging from 2x3 ft to 4x12 ft. Assuming the largest size is used, this equates to 48 sf per board, which then implies 1,916 tack boards! Given a total capacity of 300-450 employees, CERL finds it rather amazing that the AEC building would need this many tack boards. Could this possibly have also been an oversight?

23. Conceptual Plans - general comments, questions & proposal

Given that the design is entirely spatial and conceptual at this point, CERL will only briefly comment on the architectural decisions. From what can be seen and read, CERL would like to suggest the possibility that the building could simply occupy the same footprint as the existing building. If the AEC can agree on a need for less employees and less occupied space, the entire scope could be reduced. Minimization is key to sustainability. A change from 95,500 sf to 70,100 sf would be a reduction of 26.6%, which would affect all major building systems.

Interpretations

Interestingly, the “showcase” status is possibly the most significant item CERL would like to comment on, as the building (as planned) really does very little that has not been done before. Comparing to other “platinum” rated buildings, it becomes clear that in order to achieve the levels of performance required by SPiRiT and LEED™, the envelope must be pushed. Reuse of portions of an existing building is an excellent start, but this has been done to an even greater extent already (see Chicago Center for Green Technology’s LEED™ “gold” reuse building).

CERL would like to propose further investigation of alternative energy sources. Reliance on the existing power grid, while simpler and cheaper than most other options, only serves to provide continued monetary support for a type of power that, in all likelihood, is not the most environmentally-friendly. Solar power may not be the solution, however, and for this reason, SPiRiT outlines many other options for consideration. Perhaps the best answer would be a hybrid system, utilizing alternative fuels for times when the building needs less power, and simply incorporate the grid power for peak needs. In this case, if the building systems can become more efficient (HVAC, lighting and office equipment especially), the AEC could slowly wean

themselves off grid power. Also, as the building ages, more solar panels/fuel cells/wind turbines/geothermal pumps could be added as funding allows. (However, CERL's analysis calculated that this may not be cost effective for this region.)

Along this same line of thought lies CERL's concern about connection of the AEC building to the existing steam line. It is understood that the steam plant is currently below capacity, but this is not a viable reason for using its byproduct to heat the building. The ground source pumps are already going to be there; simply configure the system to allow for heating (not just cooling). This way, if the base decides to shut down the steam plant, there will be no need for modifications at the AEC building. As long as demand for steam remains, there will be no reason to cease steam generation. Buildings end up overheated (in many cases), and much of the steam's energy is lost in transmission. Why heat the earth and sidewalks along the way from the plant to the building? We must anticipate the future in order to truly create sustainable buildings; and the (long-term) future at APG may not include steam. Consider saving the \$340k on the steam connection and invest in on-site heat sources.

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14. ABSTRACT The planned U.S. Army Environmental Center (AEC) administrative and command functions facility at Aberdeen Proving Ground, MD has been designated an "Army Showcase Project," which must incorporate the principles of sustainable design and development (SDD), and be worthy of the Sustainable Project Rating Tool (SPiRiT) "platinum" level rating, and the U.S. Green Building Council's (USGBC) rating of "platinum" for Leadership in Energy and Environmental Design (LEED™). The U.S. Army Engineer Research Development Center, Construction Engineering Research Laboratory (ERDC/CERL) was tasked with performing an independent review of the preliminary DD Form 1391 to: (1) determine if the proposed design will rate "platinum" in SPiRiT and LEED™, and if not, how to improve the design to ensure the "platinum" rating; (2) determine the proposed energy savings from the base case model to the proposed design, and (3) review the SPiRiT and LEED™ credits claimed by the A/E, and determine if any new credits will be associated with CERL-recommended design features. This study concluded that, with appropriate funding and review, this project has the potential to earn the "platinum" rating on both LEED™ and SPiRiT criteria, and to achieve improvements in energy savings over the baseline case.						
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