

LEED 2.0 Accredited Professional Exam Study Guide November 2003

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NOTE – This study guide is for the LEED 2.0 Accredited Professional Examination. The LEED NC program is now on version 2.1, but the exam has not been updated since original release and is still based on LEED version 2.0. Therefore, the information provided in this study guide may be somewhat out of date, yet is still accurate for the exam. The study guide is meant to help you in the goal of LEED Accreditation, but in no way is this study guide all encompassing, other reading and knowledge is still required.

The exam is expected to be updated in August 2004 to accommodate for the updates in LEED as well as to make the exam somewhat more difficult to decrease the pass rate. If you plan to be accredited it would be in your best interest to write the exam prior to August.

Official USGBC LEED Study Guide

(From USGBC website)

Introduction

The USGBC offers LEED Training Workshops throughout the United States to train building design, construction, and management professionals on how to apply the LEED Green Building Rating System and to increase their expertise as sustainable building professionals using LEED. Professional training and accreditation is intended to create an educated consumer marketplace and provide high quality and qualified LEED expertise serving that marketplace.

Exam Development

The LEED Professional Accreditation Exam has four sections. The first three sections were developed with contributions from a volunteer Task Force. This group was comprised of Certified LEED Pilot Project professionals and other USGBC members with extensive experience in the building and construction industry and the LEED Green Building Rating System. The last section, Section IV, is structured using Environmental Building News' Green Building Advisor list of design strategies, correlated with LEED credit criteria. The final exam format and questions has been reviewed and approved by the LEED Steering Committee and Board of Directors. The exam sections are as follows:

- I. Green Building Design & Construction Industry Knowledge
- II. LEED Rating System Knowledge
- III. LEED Resources and Processes
- IV. Green Design Strategies

Exam Administration

The LEED™ Professional Accreditation Exam is being offered through a third party administer, Prometric, who offers the exam electronically in over 300 fully outfitted, comfortable, proctored locations nationwide, 6 days a week for 52 weeks of the year. USGBC's goal is to make the examination process conveniently accessible to all its members, workshop attendees, and building industry professionals.

Exam Eligibility

The following qualifications for the LEED Professional Accreditation Exam are strongly recommended, but not required:

- Attendance at a USGBC-sponsored LEED Training Workshop
- Formal training as an architect, engineer, interior designer, facilities manager, or contractor
- Tenure in the building design and construction industry, or as a building management or operations professional, facilities staff, or executive

Exam Procedure

Candidates apply and schedule directly with Prometric to reserve their time and place to sit for the two-hour exam. Check the LEED Homepage, www.leedbuilding.org for registration information. Results are reported to the candidate immediately upon completion of the exam. Unsuccessful candidates can schedule to retake the exam by repeating the

previously described process. Successful candidates will be awarded LEED Professional Accreditation certificates through the US mail and listed as LEED Accredited Professionals on the USGBC Web site.

Exam Structure & Content

All four sections described above will be administered WITHOUT the use of any open book references such as the LEED Green Building Rating System™, LEED Reference Guide, or the LEED Training Workbook. All 100 questions are in multiple-choice format. Details of what the exam sections will contain and sample questions will follow.

The USGBC's LEED Certification Process

LEED Certification distinguishes building projects that have demonstrated a commitment to sustainability by meeting the highest performance standards. The following information outlines the required steps of the application process and answers the questions most frequently asked by project teams seeking LEED Certification.

Why Certify?

- Establish national leadership in the building industry and marketplace
- Validate achievement through third party review process
- Qualify for growing array of state and local government incentives
- Contribute to growing green building knowledge base
- Earn LEED Certification plaque and official certificate
- Receive marketing exposure through the USGBC web site, case studies and media announcements

Eligibility

Commercial buildings as defined by standard building codes are eligible for certification under LEED Version 2.0. Commercial occupancies include—but are not limited to—offices, retail and service establishments, institutional buildings (e.g., libraries, schools, museums, churches, etc.), hotels, and residential buildings of four or more habitable stories. If the application of LEED for a unique building type is questionable, USGBC encourages the project team to tally a potential point total using the checklist in the LEED Rating System document. The project is a viable candidate for LEED Certification if it can meet all prerequisites and achieve a minimum of 26 points.

Registration

The first step toward earning LEED Certification is project registration. Registering during the early phases of project design will ensure maximum potential for achieving certification. Registration is an important step that establishes contact with the USGBC and provides access to essential information, software tools and communications. The initial communication includes an orientation letter and access to documents and spreadsheets that explain and facilitate the formal LEED certification process.

Documentation

Once a project is registered, the project design team begins to collect documentation and perform calculations to satisfy the prerequisite and credit submittal requirements. It is helpful to have a LEED Accredited Professional as the project contact and team member responsible for shepherding the certification process. Projects must comply with the criteria outlined in the LEED version applicable at the time of project registration. To streamline the application process, required documentation should be gathered throughout the design and construction process. Documentation should be compiled in one three-ring binder following the Template provided in the Welcome Packet and including the following:

- An overall project narrative;
- The LEED Project Scorecard indicating projected prerequisites and credits and the anticipated total score for the project; and
- The Template cover sheet and required documentation for each prerequisite and credit, separated by tabs.

Credit Interpretation Requests

In some cases, project teams may encounter questions about meeting the requirements of a LEED prerequisite or credit on a specific project. The Council has established a uniform review process for registered project inquiries, called credit interpretation requests, to ensure that rulings are consistent and made available to future projects. The recommended procedure for reviewing credit questions is outlined below:

1. Consult the LEED Reference Guide for a detailed description of the credit intent and requirements.
2. Review the LEED Credit Interpretations Rulings (CIR) page for previously logged CIRs on relevant credits. All LEED project contacts have access to this page.
3. If a similar credit interpretation has not been logged, submit a new credit interpretation request using the online form. The inquiry should be succinct and based on information found in the Reference Guide, with emphasis on the intent of the prerequisite or credit. Relevant project details may be described to support the project team's interpretation of the credit or prerequisite.

An official ruling by the USGBC Credit Ruling Committee will be posted to the Credit Interpretation Rulings page within three weeks.

Certification

To earn LEED Certification, the applicant project must satisfy all of the prerequisites and a minimum number of points to attain a LEED rating. The certification review process includes the following:

1. **Application Submittal:** The project team submits two copies of the project application and the corresponding fee to the LEED Certification Manager.
2. **Administrative Review:** An administrative compliance review is completed within one week from the USGBC's receipt of the application. Each credit is reviewed for compliance and completeness. If the documentation is insufficient, the project contact is notified of the deficiencies. The technical review begins when the issues raised by the administrative review are resolved.
3. **Technical Review:** Within two weeks of administrative approval, the USGBC issues a Preliminary LEED Review document noting points earned, pending and rejected. The project team has 30 days from the receipt of the preliminary review to provide corrections and/or additions to the application. The USGBC conducts a Final LEED Review of the application within 30 days of receiving the resubmittal and recommends a final application score to the LEED Steering Committee. The LEED Steering Committee accepts or rejects the recommended final application score within two weeks of receipt and notifies the project contact of the LEED Certification.

4. **Award:** Upon notification of the LEED Certification, the project team has 30 days to accept or appeal the awarded certification. Upon the project's acceptance, or if it has not appealed the rating within 30 days, the LEED Certification is final. The project may then be referred to as a LEED Certified Green Building. The USGBC presents the project team with a certificate and a metal LEED plaque indicating the certification level.
5. **Schedule:** The USGBC offers a compressed review schedule to accommodate project dedications, media events or other celebrations. The project's specific time constraint must be noted at the time of application and accompanied by a check for double the certification fee noted in the table below. The RUSH schedule is two weeks for Preliminary LEED Review, two weeks for the project to resubmit for final review, and two weeks for Final LEED Review (for a minimum of 6 weeks from receipt of the complete project application).

Frequently Asked Questions

Q. Our company manufactures a building product. How do we get our product LEED-certified?

A. LEED Certification applies only to building projects, not materials, products or services. Per each credit, the LEED Rating System either specifies technical requirements or defers to standards developed by other entities. Certifiers of product claims include Scientific Certification Systems and Green Seal. Evaluators of green products include Environmental Building News and other directories of sustainable products. Building products do not necessarily need to be certified. Refer to related credits within the LEED Rating System to review specific performance requirements.

Q. How do I become LEED certified? Do I get to certify LEED buildings?

A. The USGBC certifies building performance under the LEED Rating System and accredits professionals who pass the LEED Accreditation Exam. LEED Accredited Professionals facilitate the sustainable design and LEED application processes. Project applications are reviewed by the USGBC to determine formal LEED Certification status.

LEED CERTIFICATION EXAM STUDY NOTES

PROCESS:

1. Register with USGBC (On-line only!!)
2. Design team collects information and performs calculations. (Design Charette, Design Phase)
3. Submittals collected and submitted in 3-ring binders.
 - a. LEED Project Application Form
 - b. LEED Project Scorecard indicating projected prerequisites and credits and total for project.
 - c. Overall project narrative.
 - d. Documentation for each prerequisite and credit separated by tabs
4. If any questions: LEED Credit Interpretation Ruling (CIR) Page. If that doesn't help, second, submit an on-line credit interpretation request form to USGBC. (Preconstruction and Construction Phase)
5. USGBC performs peer review of credit interpretation request and submit answer on-line on the Ruling Page.
6. Project Team submits a complete application to the USGBC for review and pay all certification fees, found on website. (Post Construction Phase)
7. USGBC technical staff completes compliance review (reject or forward to administration for review).
8. Within 14 days of administrative approval, the USGBC issues a preliminary review document to team listing all deficiencies in application with a preliminary rating.
9. Project team has 30 days to review document and provide additional documentation.
10. USGBC conducts a final review within 30 days of receiving additional documentation and submits a recommended final application score to the LEED Steering Committee.
11. LEED Steering Committee accepts or rejects recommended final application score within 1 month of receipt and notifies project team of final LEED score and certification level achieved.
12. Upon notification, team has 1 month to accept or appeal level awarded.
13. After acceptance, the project may then be referred to as a LEED Certified Green Building – and the team is presented with a plaque and is issued 2 press releases recognizing the team and the project.

Principles of Green Construction:

1. Minimize resource consumption (conserve)
2. Maximize resource reuse (reuse)
3. Use renewable or recyclable resources
4. Protect the natural environment
5. Create a healthy, non-toxic human environment
6. Apply Life Cycle Cost Analysis
7. Pursue quality in creating the built environment.

OWNER BENEFITS:

1. Reduce or neutralize first costs
2. Optimize life cycle economic performance
3. People costs
4. Facility operations costs
5. Maintenance costs
6. Indoor Environmental Quality enhancements
7. Productivity enhancements
8. Sick Building Syndrome liability reductions
9. Reduced impact of design and construction
10. Reduced impact of business operations
11. Leadership in corporate caring
12. Environmental consciousness
13. Employer of choice
14. Good corporate citizen
15. Market differentiation
16. Dow Jones sustainability index

LEED Credit Review:

5 Sustainable Categories plus the Process & Innovation Category

7 Prerequisites

69 total points available

FEES: Certification: \$1,200 member/ \$1,500 non-member (includes 2 credit inquiries - \$220 each after 2) (The fees have since changed but the exam is based on the old system)

Sustainable Sites

PR-1: Erosion & Sedimentation Control

- Design to a sediment and erosion control plan that conforms to US EPA 1992 Stormwater Management for Construction Activities

1: Site Selection (1 pt)

- Do not develop on: prime farmland, land whose elevation is 5' above the 100-year flood plain level, land which provides habitat for species on threatened or endangered species list, land within 100 feet of a wetland, land which prior to acquisition was public parkland

2: Urban Redevelopment (1 pt)

- Increase localized density to conform to existing or desired density goals – utilizing sites that are located within an existing minimum development density of 60,000 square feet per acre (2 story downtown development)

3: Brownfield Redevelopment (1 pt)

- Develop on a site documented as contaminated or on a site classified as Brownfield by a local, state, or federal agency. Effectively remediate site contamination

4: Alternative Transportation (4 pts)

- Locate building within ½ mile from commuter/light rail/ subway or ¼ from 2 or more bus lines
- Provide suitable means for securing bikes with changing/shower facilities for 5% or more of building occupants
- Install alternative fuel refueling stations for 3% of total parking capacity
- Size parking capacity not to exceed minimum local zone requirements and provide carpool or van pool capable of serving 5% of the building occupants

5: Reduced Site Disturbance (2 pts)

- Greenfield sites: limit site disturbance to 40 feet beyond building perimeter and 5' beyond primary roadway curbs, walkways, and utility branch trenches, and 25' beyond pervious paving areas. Or on previously developed sites, restore a minimum of 50% of open area by planting native or adapted vegetation
- Reduce the development footprint to exceed the local zoning's open space requirement for the site by 25%

6: Stormwater Management (2 pts)

- No net increase in the rate and quantity of stormwater runoff, or if existing imperviousness is greater than 50%, implement a stormwater management plan to reduce by 25%
- Treatment systems designed to remove 80% total suspended solids and 40% of the average post development phosphorous by implementing Best Management Practices

7: Landscape and Exterior Design to Reduce Heat Islands (2 pts)

- Provide shade on at least 30% of non-roof impervious surface on the site (within 5 years) or use light-colored materials with reflectance of at least .3 for 30% of the non roof surfaces OR a minimum of 50% of parking spaces underground or use open grid pavement system (net imperviousness of less than 50%) for a minimum of 50% of parking lot
- Use Energy Star compliant and high emissivity roofing for a minimum of 75% of the roof or install a green roof for 50% of roof area

8: Light Pollution Reduction (1 pt)

- Do not exceed Illuminating Engineering Society of North America and design interior and exterior lighting so that zero direct beam illumination leaves the building site. Provide enough illumination for safety, accessibility and public perception, which at the same time avoiding unnecessary light pollution

Water Efficiency

1: Water Efficient Landscaping (1-2 pts)

- Use high efficiency irrigation or use captured rain or recycled water to reduce potable water consumption by 50%
- Use only captured rain or recycled site water for an additional 50% reduction (now 100%) of potable water for site irrigation needs or do not install permanent landscape irrigation systems

2: Innovative Wastewater Technologies (1 pt)

- Reduce the use of municipally provided potable water for building sewage conveyance by 50% or greater OR treat 100% of wastewater onsite to tertiary standards

3: Water Use Reduction (1-2 pts)

- Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building after meeting Energy Policy Act of 1992.
- Exceed the potable water use reduction by an additional 10% (or 30% total)

Energy and Atmosphere

PR-1: Fundamental Building Systems Commissioning

- Implement the following 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

PR-2: Minimum Energy Performance

- Design to meet building energy efficiency and performance as required by ASHRAE 90.1-1999 or the local energy code, whichever is more stringent

PR-3: CFC Reduction in HVAC & R Equipment

- Zero use of CFC based refrigerants in new building HVAC & R base building systems
- 1: Optimize Energy Performance (1-10pts)
 - Reduce design energy cost as compared to ASHRAE 90.1-1999 by up to 60% – Reduce demand, harvest free energy, increase efficiency
 - 2: Renewable Energy (1-3 pts)
 - Supply a percentage of the building's total energy use through the use of on-site renewable energy systems – 5%
 - 10%
 - 20%
 3. Additional Commissioning (1 pt)
 - Conduct a focused review of design prior to construction documents phase, conduct a focused review of construction documents, conduct a selective review of contractor submittals of commissioned equipment (by a firm other than the designer), develop a recommissioning management manual, have a contract in place for a near-warranty-end or post-occupancy review
 4. Ozone Depletion (1 pt)
 - Install base level HVAC and refrigeration equipment and fire suppression systems that do not contain HCFC's or Halon
 5. Measurement and Verification (1 pt)
 - Long term continuous measurement of performance for lighting systems and controls, constant and variable motor loads, variable frequency drive operation, chiller efficiency at variable loads, cooling load, air and water economizer, air distribution static pressures, boiler efficiencies, indoor water risers and outdoor irrigation systems
 6. Green Power (1 pt)
 - Engage in a 2-year contract to purchase power generated from renewable resources

Materials and Resources

PR-1: Storage & Collection of Recyclables

- Provide an easily accessible area that serves the entire building and is dedicated to the separation, collection and storage of materials for recycling. Must include paper, cardboard, glass, plastics, and metals
- 1: Building Reuse (1-3 pts)
 - Maintain at least 75% of existing building structure and shell
 - Maintain an additional 25% of existing building structure and shell (100% total)
 - Maintain 100% of existing building structure and shell and 50% of non-shell (walls, floor coverings, ceiling systems)
 - 2: Construction Waste Management (1-2 pts)
 - Recycle and/or salvage at least 50% of construction, demolition and land clearing waste
 - Recycle and/or salvage an additional 25% (75% total) of construction, demo and land clearing waste
 - 3: Resource Reuse (1-2 pts)
 - Specify salvaged or refurbished materials for 5% of building materials
 - 10%
 - 4: Recycled Content (1-2 pts) (**requirement has since changed**)
 - Specify a minimum of 25% of building materials that combine 20% post-consumer recycled content or a minimum of 40% post-industrial recycled content
 - Specify that an additional 25% (50% total) contain in aggregate a minimum weighted ave of 20% post-consumer or 40% post-industrial
 - 5: Local/Regional Materials (1-2 pts)
 - Specify a minimum of 20% of building materials that are manufactured within 500 miles regionally
 - Of these regionally manufactured materials, specify a minimum of 50% are extracted, harvested, or recovered within 500 miles
 - 6: Rapidly Renewable Materials (1 pt)
 - Specify rapidly renewable materials for 5% of total building materials
 - 7: Certified Wood (1 pt)

- Use a minimum of 50% of wood-based materials certified in accordance with the Stewardship Council Guidelines – including structural and general dimensional framing, flooring, finishes, furnishings, and non-rented temp construction applications

Indoor Environmental Quality

PR-1: Minimum IAQ Performance

- Meet the minimum requirements of voluntary consensus standard ASHRAE 62-1999, Ventilation for Acceptable Indoor Air quality

PR-2: Environmental Tobacco Smoke Control

- Zero exposure of nonsmokers to Environmental Tobacco Smoke by prohibition of smoking in the building or providing a smoking area that is ventilated separately and sealed from slab to slab

1: Carbon Dioxide Monitoring (1 pt)

- Install a permanent carbon dioxide monitoring system that provides feedback on space ventilation performance that affords operational adjustments

2: Increase Ventilation Effectiveness (1 pt)

- Mechanically ventilated buildings design system that results in air change effectiveness greater than or equal to .9. Naturally ventilated spaces demonstrate a distribution and laminar flow pattern involving not less than 90% of the room or zone area for at least 95% of the occupancy hours

3: Construction IAQ Management Plan (1-2 pts)

- During construction meet or exceed minimum requirements of the SMACNA guidelines for occupied buildings and protect stored on-site or installed absorptive materials from moisture damage AND replace all media immediately prior to occupancy
- After construction conduct a minimum 2-week building flush-out with new filtration media at 100% outside air or conduct baseline IAQ testing

4: Low Emitting Materials (1-4 pts)

- Adhesives and sealants must have a VOC content less than the limits of South Coast Air Quality Management District Rule #1168 and sealants used as filters must meet or exceed requirements of Bay Area Air Quality Management District Regulation 8, Rule 51
- Paints and coatings must not 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 and agrifiber products must contain NO added urea-formaldehyde resins

5: Indoor Chemical & Pollutant Source Control (1 pt)

- Employ permanent entryway system (grilles/grates) to capture dirt/particulates from entering building AND provide areas with structural deck to deck partitions with separate exhaust where chemical use occurs AND provide drains plumbed for appropriate disposal of liquid waste where chemical mixing occurs

6: Controllability of Systems (1-2 pts)

- Individual occupant control – provide a minimum of one operable window and one lighting control zone per 200 sf for all occupied areas within 15 feet of perimeter walls
- Provide controls for individuals for airflow, temp and lighting for 50% of the non-perimeter, regularly occupied areas

7: Thermal Comfort (1-2 pts)

- Comply with ASHRAE 55-1992 standard for thermal comfort
- Install a permanent temp and humidity monitoring system configured to provide operators control over system of building

8: Daylight and Views (1-2 pts)

- Achieve a minimum daylight factor of 2% in 75% of all space occupied for critical visual tasks, not including copy, storage, mechanical, laundry etc... exceptions include where tasks would be hindered by use of daylight
- Direct line of sight to vision glazing from 90% of all regularly occupied spaces, not including low occupancy rooms

Innovation and Design

1: Innovation in Design (1-4 pts)

- Using the LEED credit equivalence process, identify the intent of the proposed innovation credit, the proposed requirement for compliance, the proposed submittals to demonstrate compliance and the design approach used to meet the required elements. Those measures that significantly exceed the requirements of an existing LEED credit or a measure that is not addressed by any LEED credits are considered as potential innovation points – significant effort required.

2: LEED Accredited Professional (1 pt)

- At least one principal participant of the project team has successfully completed the LEED Accredited Professional exam.

EXTRA INFORMATION THAT MAY COME IN HANDY:

USGBC formed in 1993.

LEED: Leadership in Energy and Environmental Design

Version 1.0, launched at USGBC summit in August 1998

LEED 2.0 Second Edition, released in March 2000

LEED 2.1 available Nov 2002

Green design measures reduce operating costs, enhance building marketability, increase worker productivity, and reduce potential liability resulting from indoor air quality problems.

LEED is used on commercial, industrial and high-rise residential (4 or more stories) developments.

“The LEED Green Building Rating System is a voluntary, consensus-based, market-driven building rating system 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’”

Green Related Associations:

- FSC – Forest Stewardship Council
- EPA – Environmental Protection Agency
- USGBC – US Green Building Council

Other Associations:

- ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers
- IESNA – Illuminating and Engineering Society of North America
- OSHA – Occupational Safety and Health Administration
- SMACNA – Sheet Metal and Air Conditioning National Contracting Association

Which Standard / Association is related to specific individual LEED Credits:

- ASHRAE 62-1999 – Minimum IAQ performance
- ASHRAE / IESNA 90.1-1999 – Energy & Atmosphere credits including Minimum Energy Performance & Optimize Energy Performance.
- ASHRAE 55-1992 Addenda 1995 – Thermal Comfort
- ASHRAE 129-1997 – Ventilation Effectiveness
- IESNA – Light Pollution Reduction
- Energy Policy Act of 1992 – Water Use Reduction

- FSC – Certified Wood
- SMACNA – Construction IAQ Management Plan

Green publications:

- Environmental Building News (EBN), EBN's Green Spec Product Directory, & EBN's Green Building Advisor
- Environmental Resource Guide (by the AIA) (guide for materials life cycle)
- EPA Comprehensive Procurement Guideline (for recycled/recovered content materials)
- Sweets Catalogue (product directory)

Related websites:

- www.usgbc.org
- www.rmi.org
- www.epa.gov

Know the different submittal requirements for example:

- Site Selection – LEED letter only declaring the project meets requirements
- Brownfield –LEED letter and a letter from local regulatory agency or regional EPA office
- Alternate Transportation, Parking Capacity – design narrative, parking plan, company literature demonstrating carpool, and a copy of local zoning requirements

Difference between emissivity and solar reflectance:

- Emissivity - The ratio of the radiation emitted by a surface to that emitted by a black body at the same temperature
- Solar Reflectance – the ratio of the reflected electromagnetic energy to the incoming electromagnetic energy

Definition of albedo:

- Albedo - The ratio of the amount of light reflected by an object and the amount of incident light; a measure of the reflectivity or intrinsic brightness of an object (a white, perfectly reflecting surface would have an albedo of 1.0; a black perfectly absorbing surface would have an albedo of 0.0).

Definition of fenestration:

- Fenestration - The placement (or arrangement) and sizing of the windows and exterior doors of a building.

Definition of embodied energy:

- Material's embodied energy - The collective amount of energy that is used to produce a given product, including all the energy used to make the raw material into the finished product and the transportation used to carry it through the manufacturing process and to its final place of sale or use

Optimizing Energy Performance – Understand the 3 fundamental approaches to increase energy performance and the different strategies that could be involved:

- reduce demand
- harvest site energy
- maximize efficiency

Urban areas vs. their rural counterparts can be artificially elevated by 10 degrees due to heat island effect

Commissioning agents are recommended to be independently contracted by the owner.

Acceptable forms of renewable energy (EA Credit 2) are photovoltaic, wind and biomass.

Acceptable forms of green power (EA Credit 6) are solar, wind, geothermal, biomass, or low-impact hydro.

Know the difference between building reuse and resource reuse.

OSHA does not protect building occupants, but does protect installers, laborers, etc.

Understand difference between passive solar and renewable energy

VOC – volatile organic compound – are chemical compounds that contribute to air pollution inside and outside of buildings.

Understand when you would use an innovation and design credit.

Sample Questions

Section 1: Green Building Design and Construction Industry Knowledge (30 questions)

The purpose of this section is to demonstrate the candidate's general understanding of the green building design and construction industry by testing their knowledge of industry standards and processes as they relate to green building practices and the five categories in LEED Green Building Rating System™.

1. Sample Question: Green building practices encourage commissioning agents to be:
 - A. An independent contractor hired directly by the owner.
 - B. Hired directly by the mechanical subcontractor.
 - C. Typically members of the design team.
 - D. Hired at the completion of the project.

2. Sample Question: The Environmental Resource Guide is a:
 - A. Comprehensive guide documenting materials' life-cycle analysis.
 - B. Publication of the EPA's list of approved products.
 - C. Document of federal guidelines for environmental practices.
 - D. Environmental guidelines for wastewater treatment and outflow.

3. Sample Question: All of the following are undesirable sustainable sites on which to build except:
 - A. A site within 500 feet of a wetland.
 - B. Land that provides habitat to endangered species.
 - C. Land at an elevation of 5 feet or below the 100-year flood plain.
 - D. Prime agricultural land.

4. Sample Question: All of the following describe a material's embodied energy except:
 - A. Maintenance and operating energy.
 - B. Energy required to harvest/mine, manufacture, transport and install.
 - C. Cradle to grave.
 - D. Life-cycle analysis.

5. Sample Question: The heat island effect can contribute what ambient temperature increase:
 - A. 5 degrees
 - B. 10 degrees
 - C. 15 degrees
 - D. 20 degrees

6. Sample Question: Emissivity is defined as?
 - A. Amount of reflectance
 - B. Amount of radiated heat energy
 - C. Amount of energy absorption
 - D. Shading coefficient

7. Sample Question: A contractor staging area contributes to which of the following?
 - A. Reduce Site Disturbance
 - B. Stormwater Management
 - C. Construction Waster Management
 - D. Water Use Reduction

8. Sample Question: The best roof system to capture rainwater is:
 - A. Red standing seam metal roof
 - B. Black modified bitumen

- C. White single ply
 - D. Black asphalt shingles
9. Sample Question: Who needs to be involved in design of a greywater system?
- A. Architect and client
 - B. Architect, plumbing contractor, client
 - C. Architect, plumbing engineer, civil engineer, local agency
 - D. Plumbing consultant
10. Sample Question: If you are using certified wood millwork, where is the best place to inform the contractor?
- A. Specifications Section Div. 6 – Architectural Finished Woodwork
 - B. Millwork shop drawing
 - C. General conditions Div. 1
 - D. The construction drawing
11. Sample Question: Historically what is the highest construction waste by volume that goes into landfill?
- A. Gypsum board
 - B. Asphalt
 - C. Glass
 - D. Wood
12. Sample Question: Filtration basins apply to which category?
- A. Water use reduction
 - B. Reduced site disturbance
 - C. Storm water management
 - D. Innovative waste water technologies
13. Sample Question: What does not contribute to the R-value of a the window system?
- A. U-Value
 - B. Solar reflectance
 - C. Light transmittance
 - D. Air Space
14. Sample Question: OSHA serves to protect all but:
- A. Subcontractors
 - B. Building Occupants
 - C. Building maintenance workers
 - D. Construction workers
15. Sample Question: In a set of documents, where would you find the limit line for site disturbance?
- A. Civil Plan
 - B. Architectural Plan
16. Sample Question: What organization defines the standards for the use of boilers and chillers?
- A. SEER
 - B. EER
 - C. ILPV
 - D. AIA

Section II: LEED Rating System Knowledge (20 questions)

The purpose of this section is to demonstrate the candidate's general knowledge of the LEED Green Building Rating System™ Version 2.0.

1. Sample Question: The following are all prerequisites for LEED Certification except:
 - A. Low-VOC Emitting Materials
 - B. Fundamental Building Systems Commissioning
 - C. Storage and Collection of Recyclables
 - D. Environmental Tobacco Smoke Control

2. Sample Question: Point(s) are credited toward a project's LEED Green Building Certification for:
 - A. Involving a LEED Accredited Professional to guide the project.
 - B. Meeting the prerequisites of the rating system.
 - C. Registering the project during the early stages of the design.
 - D. Having all the design team members take the LEED training workshop.

3. Sample Question: Constructing a building baseline model establishes a / an:
 - A. Foundation to test specific greening strategies to weigh their effect.
 - B. Instrument by which to test daylighting.
 - C. Benchmarking to measure reductions in VOC's on air quality.
 - D. Building footprint on its site.

4. Sample Question: In providing requirements for classification of the Brownfield Redevelopment Credit, which agency prepares the letter for confirmation?
 - A. Federal EPA headquarters
 - B. Local regulatory office or regional EPA headquarters
 - C. Regional EPA headquarters
 - D. Local regulatory office

5. Sample Question: Bicycle parking must be provided for what percentage of building occupants to receive the Alternative Transportation Credit 4.2?
 - A. 5%
 - B. 10%
 - C. 15%
 - D. 25%

6. Sample Question: Fluorescent lights with electronic ballasts pertains to which category:
 - A. Light Pollution Reduction
 - B. Controllability of Systems
 - C. Optimize Energy Performance

7. Sample Question: How many Innovation credits are possible?
 - A. 4
 - B. 2
 - C. 6
 - D. Unlimited

8. Sample Question: What is the most likely Innovation Credit?
 - A. Regional sustainability issues
 - B. Use of new technology or product
 - C. Exceeding LEED criteria
 - D. Letter of merit from Owner

9. Sample Question: What do you need to provide for Credit 4.4 except:
 - A. Local zoning requirements
 - B. Parking plan
 - C. Design narrative and company literature demonstrating carpool programs
 - D. Maximum parking plan

10. Sample Question: Which of the following would not provide points in the Alternative Transportation Credit?
 - A. Building located within 2 miles of rail line
 - B. Provide preferred parking for carpools
 - C. Bicycle parking for 5% of building occupants
 - D. Alternative fueling station for 3% of the total vehicle parking capacity

11. Sample Question: In what credit category would the IESNA recommended practice manual apply?
 - A. Light Pollution Reduction
 - B. Minimum Energy Performance
 - C. Thermal Comfort
 - D. Measurement and Verification

12. Sample Question: The following would require baseline calculations except:
 - A. Stormwater Management
 - B. IAQ
 - C. Minimum Energy Performance
 - D. Thermal Comfort

13. Sample Question: In submitting for transportation credit 4.4, provide the following information except:
 - A. Parking plan highlighting total capacity
 - B. Minimum parking capacity as required by local agency
 - C. Plan narrative and company literature indicating carpools serving 5% of building occupants
 - D. Maximum parking plan

14. Sample Question: In which category are the most points available?
 - A. Energy and Atmosphere
 - B. Sustainable Sites
 - C. Material and Resources
 - D. Indoor Environmental Quality

15. Sample Question: What level should the minimum energy efficiency for the base building and systems be?
 - A. ASHRAE 90.1-1999
 - B. Local Codes
 - C. Local codes or ASHRAE 90.1-1999, whichever is more stringent
 - D. ASHRAE 90.1-1999 or Energy Star

16. Sample Question: In Credit 7 – Landscape and Exterior Design to reduce Heat Islands, the word “albedo” has the same meaning as?
- A. Absorption
 - B. Radiation
 - C. Reflectance
 - D. Emissivity
17. Sample Question: Each of the following classifies as a Brownfield Site except
- A. Under-utilized agricultural land
 - B. Sites where land is real or perceived environmental issues
18. Sample Question: For water use reduction credits, which of the following information is required for documentation:
- A. Contractor cut sheet of fixtures
 - B. Specifications for fixtures
 - C. Letter from the owner
19. Sample Question: In specifying commissioning requirements for a project which specifications would commissioning be applied?
- A. Division 1
 - B. Division 17
 - C. Divisions 1, 15, 16, 17
 - D. Divisions 1, 17
20. Sample Question: All of the following are needed for documentation of the Sustainable Sites Credit 4.4- Minimize parking capacity, except:
- A. Map of proximity to public transit
 - B. Narrative and company literature
 - C. Local zoning ordinance
 - D. Parking Plan
21. Sample Question: What tool would you use to calculate the use of local/regional materials credit?
- A. Spreadsheet
 - B. Calculator
 - C. Local phone book
 - D. Sweets Catalog
22. Sample Question: All of the following would be helpful in acquiring the water efficient landscaping credit, except:
- A. Macro-irrigation system
 - B. Drip irrigation
 - C. Indigenous plants
 - D. Greywater collection system Calculator
23. Sample Question: To document the Indoor Environment Quality credit 5, Indoor chemical & Pollutant Source Control, you need all of the following except:
- A. Specifications of chemicals used in the building
 - B. A narrative and drawings of deck to deck conditions
 - C. Drawing a narrative of plumbing systems employed in chemical mixing areas
 - D. Drawings and cut sheets of entry systems

24. Sample Question: Which of the following is not acceptable to obtain Energy Credit 6 “Green Power”?
- A. Solar energy
 - B. Wind
 - C. Water
 - D. Ground Source Heat
25. Sample Question: To obtain the IEQ Prerequisite 2 “Environmental Tobacco Smoke (ETS) Control” credit, you must document all of the following except:
- A. Provide zero exposure to nonsmokers of ETS.
 - B. Provide drawings and a narrative demonstrating smoking areas have independent smoking areas
 - C. Provide an accessible outdoor smoking area.
 - D. Provide a letter from the testing engineer stating compliance with ASHRAE 129-1997.
26. Sample Question: All of the following are acceptable towards the IEQ Credit 2 Increased Ventilation Effectiveness except:
- A. Displacement ventilation
 - B. Fan-powered mixing boxes
 - C. Under-floor ventilation system
 - D. Strategically designed operable windows

Section III: LEED Resources and Processes (20 questions)

The purpose of this section is to demonstrate the candidate’s understanding of the LEED™ project registration, technical support, and certification process and knowledge of the LEED™ certification documentation requirements.

1. Sample Question: LEED projects are registered with the USGBC by:
- A. Completing the on-line registration section of USGBC’s Web site.
 - B. Setting up a meeting with a USGBC representative.
 - C. Completing the USGBC’s automated telephone registration.
 - D. Printing and completing the on-line registration form and mailing it to USGBC.
2. Sample Question: All of the following are avenues of technical assistance for using LEED except?
- A. Unlimited Free Credit Interpretations.
 - B. LEED Reference Guide.
 - C. Access to Posted Credit Interpretation Rulings
 - D. LEED Training Workshop
3. Sample Question: LEED certification applications should be in the form of project:
- A. Notebooks organized by the LEED Rating System credit category.
 - B. Description and letter from the owner.
 - C. Building plans and specifications.
 - D. Scope of work (SOW) and request for proposal (RFP).
4. Sample Question: Through the USGBC, how many interpretation rulings are provided for free?
- A. 0
 - B. 2
 - C. 10
 - D. Unlimited

5. Sample Question: If you are unclear about a credit, where do you look first?
 - A. Reference Guide
 - B. Online Credit Interpretations Ruling
 - C. Call LEED program manager
 - D. Meet with design team

6. Sample Question: All of the following have Commissioning Guidelines except:
 - A. Bonneville Power Administration
 - B. Portland Energy Conservation, Inc.
 - C. ASHRAE
 - D. AIA

7. Sample Question: For final project certification who review the submittal?
 - A. The USGBC LEED committee
 - B. The LEED program manager
 - C. The project team
 - D. Local Authorities

8. Sample Question: In low emitting materials, paints and coating VOC standards are established by:
 - A. South coast air quality management district
 - B. Bay Area Management district
 - C. Green Seal
 - D. ASHRAE 62-1999

9. Sample Question: Thermal comfort guidelines for temperature, humidity monitoring and controls are established by:
 - A. ASHRAE 55-1992
 - B. LEED Energy Modeling Protocol
 - C. IESNA Recommended Practice Manual
 - D. Local Authorities

10. Sample Question: In meeting the prerequisite criteria for minimum energy performance, minimum standards shall follow:
 - A. ASHRAE 90.1-1999 or the local energy code, whichever is greater
 - B. LEED Energy Modeling Protocol
 - C. ASHRAE 90.1-1999
 - D. Local energy code

11. Sample Question: Which of the following is not correct:
 - A. Commissioning and energy performance are LEED credits
 - B. Commissioning and energy performance are LEED prerequisites
 - C. ASHRAE stands for Association for Heating, Refrigeration and Air Conditioning Engineers

12. Sample Question: The following are EPA recommended recycling amounts except
 - A. Wood 25%
 - B. Concrete Masonry 50%
 - C. Ceiling Tiles 60%
 - D. Asphalt 20%

Section IV: Green Design Strategies (30 questions)

The purpose of this section is to demonstrate the candidate's understanding of green and sustainable design strategies as they relate to LEED™ credits and points. The candidate will be asked to match a green building strategy with the most appropriate LEED™ credit category.

1. Sample Question: Use porous pavement systems with high percentage of post-industrial waste:
 - A. Recycle Content
 - B. Landscape and Exterior Design and Reduce Heat Islands
 - C. Erosion and Sedimentation Control
 - D. Resource Reuse

2. Sample Question: Use modulating photoelectric daylight sensors:
 - A. Optimize Energy Performance
 - B. Daylight and Views
 - C. Light Pollution Reduction
 - D. Measurement Verification

3. Sample Question: Maintain relative humidity levels between 30%-60%.
 - A. Thermal Comfort
 - B. Controllability of Systems
 - C. Increase Ventilation Effectiveness
 - D. Indoor Chemical and Pollutant Source Control

4. Sample Question: Designate construction "staging areas"
 - A. Reduced Site Disturbance
 - B. Construction Waste Management
 - C. Erosion and Sediment Control
 - D. Construction IAQ Management Plan

5. Sample Question: Which credit does the design team have the most control over?
 - A. Site Selection
 - B. Brownfield Development
 - C. Alternative Transportation
 - D. Urban Redevelopment

6. Sample Question: Light shelves benefit the following criteria except:
 - A. Introduces daylighting deeper into spaces
 - B. Provides shading at south fenestration
 - C. Provides shelves for plants
 - D. Provides glare control

7. Sample Question: In recycled content for concrete, fly ash replaces which material?
 - A. Cement
 - B. Water
 - C. Sand
 - D. Aggregate

8. Sample Question: Which one of the following is a design strategy for renewable energy?
 - A. Photovoltaics
 - B. Solar hot water heating
 - C. Orientation of the building
 - D. Ground source heat pumps

9. Sample Question: High efficiency irrigation strategies include all of the following except:
 - A. Weather database controllers
 - B. Moisture sensors
 - C. Native plants
 - D. Macro-irrigation systems

10. Sample Question: In developing the building, which strategy will conserve the highest amount of energy?
 - A. High performance window system
 - B. Orienting the building East-West
 - C. Site selection
 - D. Solar shading devices

11. Sample Question: Which is the most pervious surface?
 - A. Gravel without fine sands
 - B. Gravel
 - C. Light colored asphalt
 - D. Concrete

12. Sample Question: In commercial applications, which fixture uses the most water?
 - A. Toilets
 - B. Drinking fountains
 - C. Showers
 - D. Lavatories used for washing hands

13. Sample Question: What building component uses the most material per square foot?
 - A. Interiors
 - B. Foundations
 - C. Shell
 - D. Structure

14. Sample Question: What material produces the smallest amount of VOCs?
 - A. Brick
 - B. Vinyl
 - C. Carpet
 - D. Paint Interiors

#	Section I	Section II	Section III	Section IV
1.	A	A	A	A
2.	A	A	A	A
3.	A	A	A	A
4.	A	B	B	A
5.	B	A	A	C
6.	B	C	D	C
7.	A	A	A	A
8.	A	B	C	A
9.	C	D	A	D
10.	A	A	A	B
11.	D	A	A	A
12.	C	D	C	A
13.	C	D		A
14.	B	A		A
15.	A	C		
16.	C	C		
17.		A		
18.		A		
19.		C		
20.		A		
21.		A		
22.		A		
23.		A		
24.		D		
25.		C		
26.		B		