Leadership in Energy and Environmental Design

LEED® PREP GA

What You Really Need to Know to Pass the LEED Green Associate Exam

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An Overview of LEED

In 1998, USGBC developed the first version of the LEED Green Building Rating System. Since that time, the LEED rating systems have continually evolved to keep up with changing technologies and to encourage sustainable building practices in a growing variety of market segments. The LEED rating systems are nationally accepted benchmarks for evaluating the design, construction, and operation of high-performance green buildings and interiors, and may be applied to buildings of all types and sizes. Each rating system establishes performance criteria for green building and describes acceptable building and development strategies. Projects that register, submit the required documentation, meet the prerequisites, and earn the specified numbers of points as defined in the most applicable rating system can become LEED certified at the Certified, Silver, Gold, or Platinum level.

Different Rating Systems for Different Project Types

To allow a variety of different types of projects to participate in LEED, USGBC has developed LEED rating systems for several market segments. Each rating system contains the intents, requirements, and potential technologies and strategies for the prerequisites and for all possible credits. The rating system for each market segment is available for download (free of charge) on the USGBC website, www.usgbc.org.

LEED comprises the following rating systems.

Green Building Design & Construction

- *LEED for New Construction and Major Renovations* (LEED NC) applies to entire commercial buildings such as offices, retail stores, hotels, institutional facilities such as libraries and churches, and residential buildings with four or more habitable stories. The owner should intend to occupy more than 50% of the building; otherwise, the project should use LEED CS. LEED NC also may be used for major renovations to existing buildings that are beyond the scope of the LEED for Existing Buildings: Operations & Maintenance rating system, which focuses on the life of the building after construction.

Green Building Basics: Design

The Design Phase

During the design phase, project team members must gather and analyze data, develop and evaluate design alternatives, and make decisions regarding the project priorities relative to the opportunities and drawbacks each present. The design phase is led by the design professionals (usually architects or engineers) and considers and integrates the work of the project consultants, such as building systems engineers, specialty systems consultants, landscape architects, and the commissioning agency.

In a LEED project, the work of the design team will be guided by the combination of credits determined most appropriate for the project. A variety of issues, technologies, and approaches must be considered to develop a comprehensive building design. The discussion in this chapter of the issues under consideration during the design phase is structured to align with the five primary LEED NC, CI, CS and EBO&M credit categories. (Innovation in Design and Regional Priority credits are covered in the chapter An Overview of LEED 2009.)

- Sustainable Sites (SS)
- Water Efficiency (WE)
- Energy and Atmosphere (EA)
- Materials and Resources (MR)
- Indoor Environmental Quality (IEQ)

Sustainable Sites: Issues and Approaches

Site selection and site planning have a major impact on the relative “greenness” of any facility. Site selection takes into consideration issues such as transportation options and travel distances for building occupants to reach the site, impact on wildlife corridors, and impact on site and regional hydrology (stormwater flows, wetlands, and so on). Decisions made during site planning will affect the building’s immediate natural community as well as its potential energy consumption and occupant comfort.

Good site planning keeps site clearing to a minimum (which can save money by requiring less site demolition), helps preserve existing vegetation, and provides a low-maintenance

Indoor Environmental Quality: Issues and Approaches

Designing a building with good indoor environmental quality (IEQ) requires consideration of the future inhabitants and the characteristics of the facility that will optimize their level of comfort while they are in the building. These characteristics make a building a healthy and pleasant place to spend time.

- ventilation
- protection from environmental tobacco smoke
- protection from potential contaminants in building materials
- protection from pollutants
- occupants' ability to control temperature and lighting
- access to natural light and views

All these factors contribute to occupants' sense of well-being. While scientific methods and instrumentation can measure levels of pollution (which includes carbon dioxide, carbon monoxide, volatile organics, ozone, particulates, and other air emissions), light, noise, and indices of comfort such as mean radiant temperature, the most telling indicator of design success is how employees feel when they are in the space. Employees can be surveyed to determine their reactions to their indoor environment and their perceptions of its effects on their performance and sense of satisfaction. Some of the statistics that may be examined include absenteeism, sick days, and drops in productivity. To make sense of this information, the data must be collected for a significant period of time, both before and after the changes.

The Rocky Mountain Institute and Pacific Gas and Electric have conducted several studies linking improvements in IEQ to improvements in productivity. In most federal facilities, for example, the cost per square foot (square meter) of the workforce is twenty times greater than the cost per square foot (square meter) of the building. This huge difference readily demonstrates that investments in IEQ that improve productivity are likely to be rapidly recovered.

Ventilation

LEED-certified buildings are required to include mechanical or natural ventilation systems that comply with ASHRAE Standard 62.1, which describes a method for verifying the ability of the ventilation system to provide fresh air to all interior spaces at a prescribed rate. Projects that exceed the minimum requirements of this standard and incorporate mechanisms for monitoring the flow of outdoor air into the building may earn additional credits. Such ventilation systems must be in operation when the building is occupied. Additional credits may be awarded to projects that include measures for protecting the HVAC system during the construction phase and those that flush the building with a high volume of outdoor air in combination with replacement of all filtration media. All these techniques are used to evacuate dust, odors, or potentially harmful fumes from the building after the completion of construction operations but before the building is occupied.

Environmental Tobacco Smoke

All LEED-certified buildings must prohibit smoking in the building and within 25 feet (7.6 m) of building openings, or provide designated smoking rooms. Smoking rooms must be equipped with exhaust systems and the smoking room must be negatively pressurized so that smoke does not enter the nonsmoking areas of the building.

ANSI/ASHRAE 62.1-2007, *Ventilation for Acceptable Indoor Air Quality* (with errata but without addenda). Most building codes incorporate all or part of this ASHRAE standard by reference, giving it the force of law and making the requirements of this standard not just the level of performance required for LEED certification, but the minimum level of performance required for code compliance. In addition to setting minimum requirements for indoor ventilation, the standard includes provisions for managing sources of contamination, controlling indoor humidity, and filtering building air, as well as requirements for HVAC system construction and startup, and operation and maintenance of systems. The standard outlines two alternative procedures that may be used to obtain acceptable air quality: the ventilation rate procedure and the indoor air quality procedure.

- *Ventilation Rate Procedure:* Acceptable air quality is achieved by providing ventilation rates equivalent to the specified quantity to the space. For example, a ventilation rate of 20 cfm/person (0.6 cu m per minute per person) is required for the average (not peak) occupancy in offices.
- *Indoor Air Quality Procedure:* Acceptable air quality is achieved by controlling known contaminants in the space. This procedure incorporates both quantitative and subjective evaluation of contaminants. Indoor carbon dioxide (CO_2) levels are often monitored as an indicator of the concentration of human bioeffluents with this procedure. An indoor-to-outdoor differential concentration not greater than 700 parts per million of CO_2 indicates that the comfort (odor) criteria related to human bioeffluents are likely to be satisfied.

Related Credits: *NC IEQp1, NC IEQc1, NC IEQc2, NC IEQc6.2, CI IEQp1, CI IEQc1, CI IEQc2, CI IEQc6.2, CS IEQp1, CS IEQc1, CS IEQc2, CS IEQc6, EBO&M IEQp1, EBO&M IEQc1.2, EBO&M IEQc1.3*

ANSI/ASHRAE/IESNA 90.1-2007, *Energy Standard for Buildings Except Low-Rise Residential Buildings* (with errata but without addenda). Sections 5 through 10 of this standard establish maximum energy use requirements and restrictions for the building envelope, ventilations, heating, and air conditioning systems, service water heating, power, lighting (including exterior lighting), and other equipment. The standard also provides methods for comparing energy efficiency design strategies. Each section contains both mandatory provisions and prescriptive requirements for compliance, and some sections contain a performance alternative for compliance. All LEED projects must meet the mandatory measures; project teams may choose between using a prescriptive compliance or a performance compliance approach. Documentation for these two approaches differs significantly.

- *Prescriptive Method:* For buildings where the team chooses to use the prescriptive method, the designers strictly follow the guidelines laid out in the standard, such as providing a recommended constant level of ventilation air to a space. In conjunction with the requirements of ASHRAE Standard 90.1, certain project types selecting the prescriptive compliance path must meet the criteria outlined in *Advanced Energy Design Guide for Small Office Buildings*, 2004; *Advanced Energy Design Guide for Small Retail Buildings*, 2006; *Advanced Energy Design Guide for Small Warehouses and Self-Storage Buildings*, 2008. These guides provide climate- and project type specific approaches to exceeding ASHRAE 90.1 requirements. Recommendations relate to the building envelope, interior lighting, and HVAC & R systems.
- *Performance Method:* In buildings where the performance method of evaluation has been selected, the overall building performance is designed to meet the intent of the standard but may not follow a strict set of requirements. For example, a designer using the performance method may specify more or less ventilation air be provided