GREEN BUILDING SITUATION IN JORDAN

LEED 201 & ID+C 301 WORKSHOPS

FINAL REPORT

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This publication was produced for review by the United States Agency for International Development. It was prepared by Rico Cedro, Solomon Cordwell Buenz (SCB)

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FINAL REPORT

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INTRODUCTION: GREEN BUILDING SITUATION IN JORDAN

Green Building Situation in Jordan can be characterized by the following:

- High proportion of engineers in Jordan.
- Energy and water are in short supply.
- Implementation of existing Jordanian policies related to design and construction is a challenge.
- Currently Jordan has 55 LEED AP, 15 LEED Registered Projects, 1 LEED Certified Project
- Jordan Green Building Council (JGBC) was created three years ago as a NGO using principles similar to USGBC.
- JGBC strategy is to become a regional center of excellence and intellectual capital center.
- JGBC is involved with the development of the LEED International rating system through the International Roundtable.

In preparation for the training delivery a meeting was held at the JGBC premises during which some logistical issues were discussed and. In addition to that I reviewed and commented on the draft 400 level course currently being prepared by the JGBC.

Five-day course developed by JGBC for delivery in Jordan and the region.

- Organized around the five major LEED credit categories with an emphasis of the use of LEED Online.
- Comments given for overall content and graphic communication.
- Course has excellent potential and draft demonstrates a high-quality approach to the creating and communicating of LEED content.

DELIVERY OF LEED 201: CORE CONCEPTS & STRATEGIES

WEDNESDAY 18 MAY 2011 9:00 PM TO 5:30 PM

KEMPINSKI HOTEL, AMMAN, JORDAN

PRESENTED TO 20 JORDANIAN LEED TRAINERS, ARCHITECTS, ENGINEERS, AND OTHER DESIGN, CONSTRUCTION, AND POLICY PROCESSIONALS

LEARNING OBJECTIVES

- Describe the structure of the LEED rating system and the overall LEED certification process
- Describe key green building concepts and goals associated with LEED
- Recognize successful LEED strategies and measurements for achieving goals
- Describe the central role of integrative design
- Identify and explain synergies between LEED credit categories and strategies
- Describe case studies that represent LEED best practices in action across the range of building markets

OVERVIEW

The workshop provides essential knowledge of sustainable building concepts that are fundamental to all LEED Rating Systems. It begins with an introduction to the benefits and integrative approach to green building, and a brief background on the U.S. Green Building Council and LEED, including basics of the building certification process.

The core of the workshop presents LEED intents and concepts at the credit category level – across building types and rating systems - touching on strategies, synergies, and specific examples that are reinforced by real project cases.

Key LEED metrics and LEED referenced standards are addressed throughout the workshop. Interactive activities within the course keep you engaged and reinforce what you've learned. This course provides the foundation required for any 300-level LEED education offering. This course, like all USGBC LEED education programs, meets GBCI eligibility requirements for the LEED Green Associate.

GREEN BUILDING ADDRESSES

- Climate Change
- Resource Depletion
- Water Consumption
- Degradation of Ecosystems / Habitat
- Indoor Environmental Quality
- Occupant Comfort and Productivity
- Costs of Owning and Operating Work and Living Spaces

SUSTAINABLE SITES INTENTS

- Reduce Transportation Demand
- Minimize Stormwater Impact
- Protect Natural Habitat
- Reuse / Restore Sites

LOCATION & PLANNING

- Choose a Smart Location
- Avoid and Protect Natural Areas
- Encourage Density and Diversity
- Create Accessibility

SITE DESIGN & MANAGEMENT

- Select Previously Developed Sites
- Preserve Habitat and Wetlands
- Protect Surface Waters and Aquatic Ecosystems
- Reduce Heat Islands
- Reduce Light Pollution
- Protect Human Health
- Reduce Environmental Impact

WATER EFFICIENCY INTENTS

- Dramatically Reduce Water Use
- Use the Right Water for the Right Purpose

INDOOR REGULATED WATER

- Reduce Potable Water Demand
- Increase Water Use Efficiency

OUTDOOR WATER

- Reduce Potable Water Demand
- Increase Water Use Efficiency

PROCESS WATER

- Reduce Potable Water Demand
- Increase Water Use Efficiency

ENERGY & ATMOSPHERE INTENTS

- Reduce Energy Use
- Increase Energy Efficiency
- Meet Energy Needs With Clean, Renewable Energy Supplies

ENERGY DEMAND

- Reduce Energy Demand

ENERGY EFFICIENCY

- Recognize Energy Baselines
- Identify Opportunities for Efficiency

ENERGY SUPPLY

- Use Incident Energy
- Purchase Off-Site Renewable Energy

ENERGY PERFORMANCE

- Monitor and Track Performance Over Time

MATERIALS & RESOURCES INTENTS

- Reduce the Amount of Materials Needed
- Use Materials With Less Environmental Impact
- Reduce and Manage Waste

WASTE REDUCTION

- Reduce Waste Generation
- Divert and Reuse Waste

MATERIALS IMPACT

- Reduce Demand for Materials
- Reuse Material
- Reuse Building
- Select New Materials With Less Lifecycle Impact

INDOOR ENVIRONMENTAL QUALITY INTENTS

- Provide Systems to Ensure a Quality Indoor Environment
- Eliminate, Reduce and Manage Contaminants

INDOOR AIR QUALITY

- Design Well-Ventilated Buildings
- Select Appropriate Materials
- Reduce / Eliminate Contaminants

- Control Moisture
- Promote Green Construction Practices

OCCUPANT COMFORT & PRODUCTIVITY

- Control Thermal Comfort
- Provide Daylight and Views
- Consider Acoustics
- Lighting Satisfaction

INNOVATION IN DESIGN INTENTS

- Explore Exceptional and Innovative Approaches
- Pursue Strategies Beyond LEED's Existing Credits or Prerequisites

INNOVATION IN DESIGN

- Exemplary Performance
- Innovation in Performance
- LEED AP
- Pilot Credits

ADDITIONAL RESOURCES

- Green Building and LEED Core Concepts Guide
- USGBC LEED Green Associate Study Guide

DELIVERY OF ID+C 301: IMPLEMENTING THE INTERIOR DESIGN & CONSTRUCTION LEED RATING SYSTEM

THURSDAY 19 MAY 2011 9:00 PM TO 5:30 PM

KEMPINSKI HOTEL, AMMAN, JORDAN

PRESENTED TO 20 JORDANIAN LEED TRAINERS, ARCHITECTS, ENGINEERS, AND OTHER DESIGN, CONSTRUCTION, AND POLICY PROCESSIONALS

LEARNING OBJECTIVES

- Explain unique aspects of the LEED 2009 for Commercial Interiors rating system
- Recognize key green decisions throughout the LEED 2009 for Commercial Interiors process.
- Implement LEED 2009 for CI process for interior fit-up projects.
- Apply integrative approach with project stakeholders.

OVERVIEW

This workshop is intended for professionals who are familiar with the basic concepts of the LEED for Commercial Interiors Rating System, but new to implementing it on projects or looking to brush up on implementation best practices. It is appropriate for new LEED APs, as well as those pursuing GBCI's LEED AP Interior Design + Construction credential.

The workshop addresses LEED tools and unique aspects of this particular rating system. Workshop participants will discuss the roles and responsibilities of key stakeholders in the LEED process, as well as strategies for communicating with team members at various stages of that process.

Official USGBC LEED Faculty, who are LEED and facilitation experts will walk the class through the phases of a typical project, including key decisions that project teams must make and guidance on how to make them. Throughout the day, you will engage with other participants in interactive activities using case examples to enable you to work hands-on with LEED implementation strategies and Rating System tools, including credit forms from LEED Online v3.

At the end of this workshop, you should be able to apply your newfound knowledge to real-life LEED projects. This course, like all USGBC LEED education programs, meets GBCI eligibility requirements for the LEED Green Associate.

LEED PROJECT RESOURCES & TOOLS

- Rating System
- Reference Guide
- LEED Online
- Green Office Guide: Integrating LEED® Into Your Leasing Process
- www.usgbc.org
- www.gbci.org

PHASE 1: SITE / BUILDING EVALUATION & SELECTION

- Establish Project Requirements.
- Select Real Estate Team.
- Determine Selection Criteria.
- Evaluate and Select Site.
- Negotiate Lease.

PHASE 1 SUMMARY

- Determine LEED Opportunities and Constraints.
- Recognize Evaluation and Selection as Sustainable Design.
- Maximize Leverage in Tenant / Landlord Relationship.

PHASE 2: CONCEPT DESIGN

- Assemble Design Team.
- Conduct Project Start-Up Activities.
- Hold Design Charrette
- Assign Credits and Prerequisites.
- Register Project in LEED Online.

PHASE 2 SUMMARY

- Connection Of LEED Strategy to Owner's Goals
- Team with Enhanced Skills
- In-Depth Base Building Analysis
- Early Decision Making

PHASE 3: SCHEMATIC DESIGN / DESIGN DEVELOPMENT

- Integrate LEED Goals Into Project Schedule.
- Commission Owner's Project Requirements.
- Develop Lighting, HVAC, and Plumbing Alternatives.
- Integrate EAp2 Minimum Energy Performance.
- Coordinate Owner-Supplied Items.
- Evaluate Material, Product, and Furniture Reuse Alternatives.
- Develop Innovation in Design Credits

PHASE 3 SUMMARY

- Schedule Milestones
- Commission Early Integration
- Engineering Decisions Including Documentation
- Strategies and Technology Choices Related to LEED Credits and Other Goals
- Owner-Supplied Items
- Innovation In Design Decisions

PHASE 4: CONTRACT DOCUMENTS & PROCUREMENT

- Integrate LEED Into Construction Documents.
- Conduct Procurement / Buy-Out.
- Enter Design Credit and Prerequisites Documentation Into LEED Online (Split Submittal Option).

PHASE 4 SUMMARY

- Both Project Documents and LEED Documents Must Communicate Clearly.
- Use Narratives Effectively.
- Coordinate Sub-Contractors and Suppliers Early.
- Allow Adequate Time for Construction Document (CD) Review.

PHASE 5: CONTRACT ADMINISTRATION

- Hold Construction Kick-Off.
- Confirm LEED Schedule Impacts.
- Evaluate LEED Materials Tracking Sheet.
- Evaluate Submittal Reviews

PHASE 5 SUMMARY

- Construction Charrette
- Construction CWM And IAQ Plans
- Schedule
- Centralized LEED Resources
- Tracking 0f LEED Credits
- Submittal Review
- Progress Reports
- Issues Log

PHASE 6: CLOSE-OUT / POST-OCCUPANCY

- Conduct LEED document quality control.
- Submit to LEED Online.
- Participate in GBCI review.
- Conduct user hand-off and training.
- Complete post-occupancy activities

PHASE 6 SUMMARY

- Importance of Documenting Quality Control
- LEED Online Submission / GBCI Final Report
- User Hand-Over
- Post-Occupancy Resources / Results
- Facts About Results and Business Metrics

CONCLUSIONS AND OBSERVATIONS

- In certain categories of the LEED rating systems—Water Efficiency, Materials & Resources and Indoor Environmental Quality—current design and construction practice in Jordan is advanced and is able to implement these aspects of the rating systems at a high level.
- In other categories—Sustainable Sites and Energy & Atmosphere—the current situation in Jordan presents challenges for implementation, particularly regarding location efficient urbanism, land use planning, alternative transport, renewable energy, and energy modeling.
- Current smoking policy and customs in Jordan creates challenges for the achievement of the LEED smoking prerequisite.
- Testing of materials and products in regard to LEED referenced standards are not developed at a level to support integration into a LEED specification process. This is critical for Jordanian materials and products to maintain marketplace advantage in context where LEED projects will become an increasing part of the design and construction sector in the future. Time exists to identify and build this capacity.
- The decision by the JGBC to pursue an NGO organizational model based on principles similar to other green building councils offers opportunities to establish independent credibility, as well as export expertise to the region. This is in opposition to the model utilized by Abu Dhabi and Qatar were the rating systems and the “green councils” are arms of the government.
- One the unanticipated impacts of the LEED rating systems are their use as public policy instruments. This presents an opportunity for the JGBC to influence policy direction in the Kingdom.
- The limited number of registered LEED projects in Jordan creates challenges for design and construction professionals to gain hands-on experience with the various LEED rating systems. This is critical for design and construction professional who wish to pursue the LEED Green Associate and Specialty credentials. Opportunities should be pursued to encourage Jordanian clients to pursue LEED for their projects. Underwriting or support of LEED project registration and certification fees by USAID and / or their stakeholders is one possibility to remove soft cost barriers to entry.
- In addition to involvement in the LEED International Roundtable, JGBC should explore with the Green Building Certification Institute future opportunities to support project certification in the region.
- Throughout the workshop, attendees were fully engaged throughout the day and especially during the team exercises. Attendees demonstrated a high level of enthusiasm and drive for knowledge.

- The attendees asked a number of insightful questions and their answers to the instructor's prompt questions demonstrated a high level of technical knowledge and experience.

APPENDICES

APPENDIX 1: PARTICIPANT WORKBOOK-LEED 201

PARTICIPANT WORKBOOK

LEED 201: CORE CONCEPTS & STRATEGIES

U.S. GREEN BUILDING COUNCIL
USGBC®

THANK YOU FOR HELPING US SUPPORT OUR MISSION

This participant workbook includes everything you need to get the most out of your learning experience.

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Continuing Education

This course is not eligible for GBCI CE hours but does satisfy the LEED Green Associate Exam eligibility requirement. Please refer to your certificate of completion for more continuing education information.

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AGENDA

- INTRODUCTION + ACTIVITY 1
- SUSTAINABLE SITES

BREAK

- WATER EFFICIENCY + ACTIVITY 2
- ENERGY & ATMOSPHERE

LUNCH

- MATERIALS & RESOURCES
- INDOOR ENVIRONMENTAL QUALITY + ACTIVITY 3

BREAK

- INNOVATION IN DESIGN
- SUMMARY + ACTIVITY 4

ACTIVITY 1

Directions

A GREEN BUILDING MIND MAP

Objectives of the Activity

Mind-mapping is a brainstorming process that involves creating a diagram of words, ideas, tasks or other associations around a central concept or idea. The intent of this exercise is to provide you with an opportunity to experience participating in a collaborative activity while creating a mind map around the concept of green building.

Directions

1. Distribute colored markers so that each member of the team has a different color.
2. In the center of the provided flip-chart paper, draw a circle with the words "Green Building" in the center.
3. Working as a group, take 5 minutes to add your ideas and associations to the mind map. Together or in turn, create new links or build on the ideas of others.
4. After completing the activity, take 5 minutes to reflect on and discuss the following questions:
    A. How did your ideas relate to those of others in the group?
    B. What contributions appeared that you would not have thought of independently?
    C. How do concepts and ideas build on one another?
    D. What diverse ideas and concepts emerged, and how might they be integrated?
5. The facilitator will stop you when 10 minutes has elapsed and initiate a discussion of the exercise.

NOTE: Your instructor may choose to facilitate this as a whole group activity rather than breaking out in groups.

ACTIVITY 2

Directions
Worksheet
Content

CASE STUDY ANALYSIS
SUSTAINABLE SITES & WATER EFFICIENCY

Objectives of the Activity

The intent of this exercise is to provide you with an opportunity to practice identifying project design and operations characteristics that demonstrate the application of Sustainable Sites and Water Efficiency concepts and intents; and to explore synergies between these credit categories.

Directions

1. You will be working in small groups for this exercise. Your facilitator will assign your group one of the case examples found on the next few pages. You will have 20 minutes to complete the exercise.

2. Individually, take a few minutes to review the background information provided on the following pages for your case study. As you read, pay attention to strategies that address the Sustainable Sites and Water Efficiency credit category intents.

3. After everyone has finished reading the case study, discuss the following questions as a group. Write your answers on the worksheet on the following page.

    A. Sustainable Sites Strategies: How well and in what ways does this project address the sustainable sites credit category intents to develop appropriate sites, reduce transportation demand, and/or increase transportation efficiency? What diverse land uses are evident?

    B. Water Efficiency Strategies: How well and in what ways does this project address the water efficiency credit category intents to reduce water consumption and reuse water when appropriate, safe and legal? What strategies did the design team use to limit the use of potable water?

    C. Synergies: How did the project benefit from synergies between Sustainable Sites and Water Efficiency strategies?

4. The facilitator will stop you when 20 minutes has elapsed and initiate a discussion of the cases. Your group should be prepared to present a brief overview of the project you reviewed and share the strategies and synergies you identified.

ACTIVITY 2

Directions
Worksheet
Content

CASE STUDY ANALYSIS WORKSHEET

Project Name:

Sustainable Sites Strategies:

How well and in what ways does this project address the Sustainable Sites credit category intents to develop appropriate sites, reduce transportation demand and/or increase transportation efficiency?

What diverse land uses (if any) are evident?

Water Efficiency Strategies:

How well and in what ways does this project address the Water Efficiency credit category intents to reduce water consumption and reuse water when appropriate, safe and legal?

What strategies did the design team use to limit the use of potable water?

Synergies:

How did the project benefit from synergies between Sustainable Sites and Water Efficiency strategies?

ACTIVITY 2A

Directions
Worksheet
Content

CASE STUDY A
BACKGROUND INFORMATION
KING STREET CENTER

Overview

Photo courtesy of King County Solid Waste Division

Location: Seattle, WA

Building Type: Existing building

Square footage: 327,000

Rating System: LEED for Existing Buildings

Certification Level: Gold

King Street Center, a commercial office building with an occupancy of 1,450, is a public-private partnership with King County and Wright-Runstad. The building houses the Departments of Natural Resources, Parks, and Transportation. It was designed to harmonize with historic building in Seattle's Pioneer Square district and was the first green building project undertaken by King County.

This redeveloped urban building is located near ample public transportation, as it was built adjacent to the train station and a short walk to a major bus transfer route that connects directly to downtown. It was built on a site that was formerly a parking lot. During construction, the project team decontaminated and recycled nearly 3,500 tons of topsoil.

There is designated parking for carpools on the street, as well as a designated bike room with rack space for 80 bikes, encouraging clean commuting. Fifty percent of all site parking is located underground, not only reducing the amount of paved surface to exacerbate stormwater runoff, but also reducing the building's contribution to the urban heat island effect. Light pollution and waste is reduced because the building has no exterior lighting, and interior lighting is primarily lens-fluorescent fixtures that are recessed or shielded.

The building has a water reclamation system that saves 1.4 million gallons of potable water per year. This system collects rainwater from the roof and reuses it to supply water for landscaping, as well as for the building's toilet flushing needs.

(Continued on next page)

ACTIVITY 2A

Directions
Worksheet
Content

CASE STUDY A
BACKGROUND INFORMATION
KING STREET CENTER

The rainwater reclamation system involves three 5,400-gallon tanks. Rainwater fills and passes through all three tanks, is filtered in small cylinders, and is then pumped up to the toilets in the building in separate piping. If there is not enough rain to meet the building's flushing needs, domestic water is automatically added to the tanks. The building uses approximately 2.2 million gallons of flushing water per year. The new system saves an estimated 1.4 million gallons of water per year, meeting more than 60 percent of the building's estimated annual water needs.

The building also has water-efficient fixtures, including touchless faucets in all lavatories; 1.0 gallon-per-flush urinals; 1.6-gallons-per-flush toilets; on-demand hot water in kitchens; and low-flow (2.5 gallons-per-minute) shower heads.

Landscaping is provided on the plaza at the back of the building and consists of drought-resistant plants and grasses. An irrigation system was used during a one- to two-year establishment period (length differed per plant), and some of the water used to irrigate was provided by the rainwater collection system. The irrigation system was disconnected in 2003 when all of the plants were established.

Case story courtesy of GreenTools Green Building Program, King County Solid Waste Division.

ACTIVITY 2B

Directions
Worksheet
Content

CASE STUDY B
BACKGROUND INFORMATION
20 RIVER TERRACE - THE SOLAIRE

Overview

Photo by HLD/ Blankman Public Relations Agency

Location: New York, NY

Building Type: New construction

Square Footage: 357,000

Rating System: LEED for New Construction

Certification Level: Gold

The Solaire at 20 River Terrace is located in the north residential area of Battery Park City, a 92-acre, publicly sponsored, planned residential and commercial neighborhood built on a landfill on the Hudson River in lower Manhattan. 52% of Battery Park City is dedicated to public uses that include parks, recreational facilities and museums. The building site for 20 River Terrace was predetermined, and the building footprint occupies the entire site. The Solaire helps to enclose Teardrop Park, a shared green space, and provides water for its irrigation. All of the adjacent parks and green spaces at the ground level existed prior to the construction of the building.

Battery Park City is located in a dense urban environment within walking distance of New York City's financial district and multiple nearby public transportation options. Parking spaces are limited to fewer than 20% of the number of residential units, and they are provided in a basement garage. The building owners contracted with ZipCar, a company offering on-demand access to rental cars, to provide hybrid technology vehicles with first priority given to building residents. Taxis and buses serve the immediate area; subway service is located within 2,000 feet of the building; and extensive ferry service is located on the adjacent waterfront. Storage is provided for bicycles, and provisions are in place for electric vehicle charging. Though there is no specific data on the building's population using single-occupancy vehicles, public transit use in New York City is the highest in the nation.

(Continued on next page)

ACTIVITY 2B

Directions
Worksheet
Content

CASE STUDY B
BACKGROUND INFORMATION
20 RIVER TERRACE - THE SOLAIRE

The Solaire has a comprehensive stormwater management plan and multiple features – including a vegetated roof and stormwater retention and reuse – that address its objectives. The vegetated roof is designed to include approximately 57% of the site area (75% of the open roof area). Beneath the vegetation and soil, the design includes a water retention layer that reduces the velocity of water flow, giving soil and vegetation an opportunity to utilize the stormwater before it reaches the building's stormwater infrastructure. The planting materials include drought-tolerant self-sustaining shrubs, perennials and bamboo, which are resistant to wind damage and adaptable to shallow soil depths. The roof system beneath the plants was designed to retain nearly 70% of rainwater for eventual use by the plants, and the process of evapotranspiration contributes to a cooling effect in the garden's microclimate.

The stormwater retention system is designed to retain 10,000 gallons of stormwater in a tank located in the basement. This system captures approximately 170,000 gallons of water per year. Within the tank is a sediment basin and treatment system. 100% of the retained water is reused for irrigation for the vegetated roof and adjacent park and as a result, no potable water is used for landscaping. The planted roofs and high-albedo roofing materials also minimize the building's contribution to the urban heat island effect.

In addition to the stormwater catchment system, the Solaire also has an on-site blackwater system that recycles 100% of the building's wastewater. Water recaptured by the system is used to supply the cooling tower and the building's toilets, and 5,000 gallons per day are provided to the adjacent public park. 50% less potable water is needed from the municipal water supply than would be used in a conventional apartment building, and no potable water is used outdoors. Low-flow appliances and fixtures are used, and the public restroom facilities use waterless urinals.

Case story courtesy of www.buildinggreen.com

ACTIVITY 3

Directions
Content

DESIGNING A NEW GREEN SCHOOL

Objectives of the Activity

The intent of this activity is to provide you with an opportunity to practice identifying project design and operations characteristics that demonstrate the application of Energy & Atmosphere, Materials & Resources and Indoor Environmental Quality credit category concepts and intents.

Directions

1. In this exercise, you and your classmates are members of an integrated design team assigned to a green building project for the Meadowview school district: construction of a new elementary school and greening of its existing schools. Your challenge is to plan strategies to meet the intents of the Energy & Atmosphere, Materials & Resources and Indoor Environmental Quality credit categories.

2. Your facilitator will assign you to groups and ask each group to focus on one of the three credit categories.

3. Your group will have 10 minutes to review the scenario on the following page and brainstorm strategies for the school that meet the intents of your assigned credit category.

4. Document the strategies you identify by noting them on the diagram of the school, visually referring to or altering the diagram, as needed.

5. Your facilitator will stop you after 10 minutes and initiate a whole-class discussion of the scenario. Your group will have an opportunity to share the strategies you planned and others in the class will be invited to contribute additional ideas. Likewise, you will be invited to contribute any additional ideas you may have to address the intents of the credit categories reviewed by the other groups. It may be helpful to add the other credit category strategies to your group's diagram because your facilitator will also lead you in a discussion of synergies across the credit categories.

ACTIVITY 3

Directions

Content

SCENARIO

Meadowview School District Project

The Meadowview community has started a greener local businesses incentive program. It is supporting some new local industries that produce strawboard, cotton batt insulation and other green products. Because the community's landfill is full, it is now imposing huge fees for dumping. And, Meadowview Power offers the opportunity to purchase renewable energy from wind farms.

As part of this greening the community program, Meadowview School District is going green. They are motivated by the benefits to the environment, the cost savings they can incur and the health benefits to their schools' staff and students. Meadowview is building a new elementary school and making their existing schools greener.

Following is a diagram of one of Meadowview's existing school buildings that was constructed in 1960. Some of the existing conditions include use of incandescent lighting as a primary lighting source, single-paned fixed windows and a dark and badly-worn roof. The HVAC system is not working consistently, windows are drafty, and moisture is coming in, causing mold problems. Teachers and students are experiencing allergy problems and headaches, which has also been increasing absenteeism.

You are a member of an integrated design team working on the project. How would you change this existing school to make it greener? How would you design Meadowview's new school to be a green school? Consider the following:

- Energy & Atmosphere Strategies:

  What strategies might you use to encourage a renewable energy supply, optimize energy performance, and predict and measure energy performance?

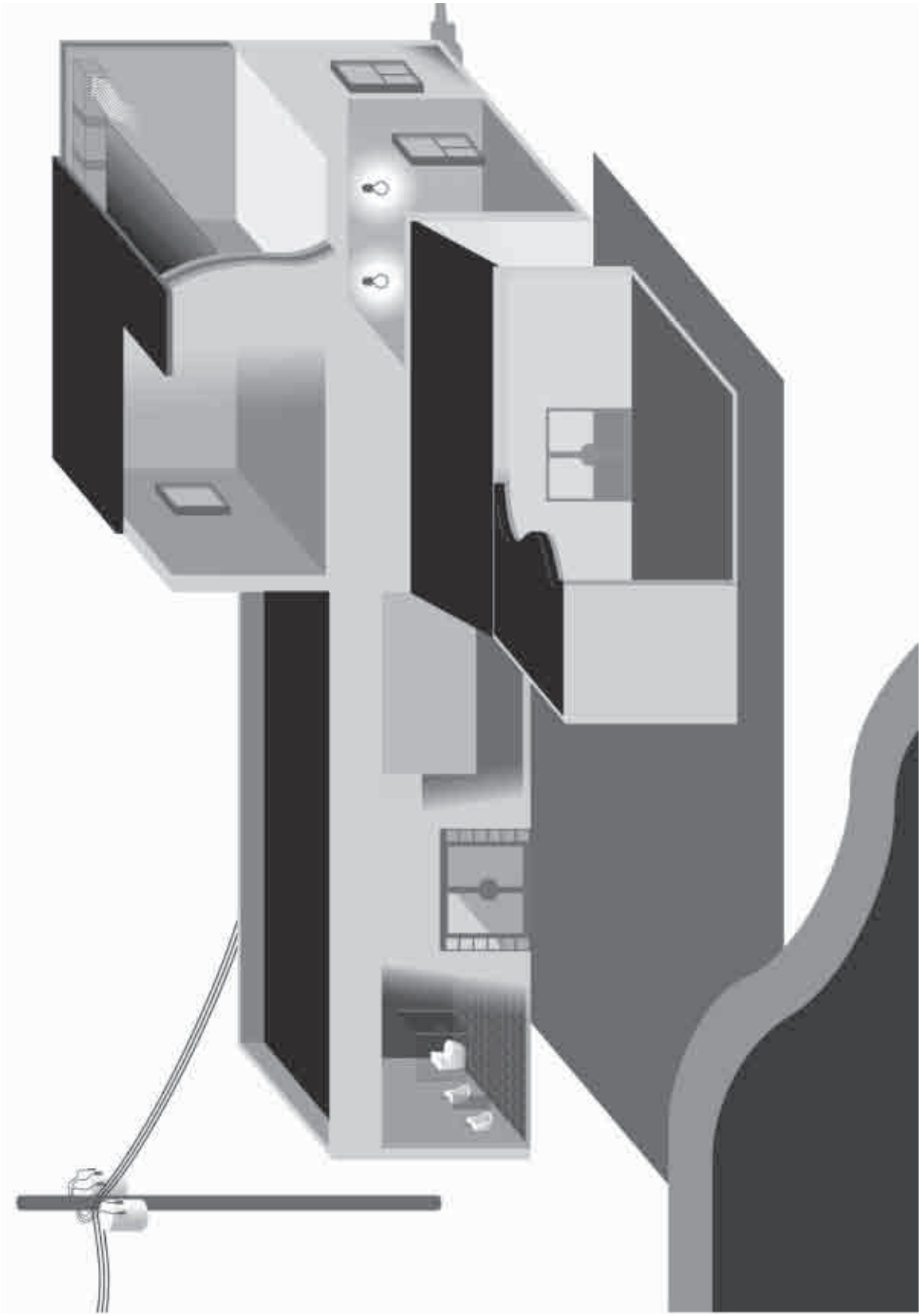
- Materials & Resources Strategies:

  What strategies might you use to reduce the amount of materials needed for the project and reduce the impacts of the materials used?

- Indoor Environmental Quality Strategies:

  What strategies might you use to eliminate, reduce and manage contaminants and ensure a quality indoor environment?

Use the diagram provided on the following page and the instructions on the previous page to brainstorm the best strategies for Meadowview.



ACTIVITY 4

Directions
Worksheet
Content

SYNERGIES CASE STUDY

Objectives of the Activity

The term "synergy" refers to a situation in which two or more efforts work harmoniously together and the effect of their interaction is greater than the sum of the parts. The intent of this exercise is to provide you with an opportunity to practice identifying synergies among credit categories.

Directions

1. Your instructor will assign you to a small group. Individually, take 5 minutes to review the example case study background on the following page.
2. With your group, take 10 minutes to complete the table that follows the case study. In the left column, list the green building strategies you identify. Next, place a checkmark in the box corresponding to the LEED credit categories that each strategy supports. Note that some strategies may support more than one credit category. Use multiple sheets if needed.
3. Review your completed table and consider the following questions:
    A. What credit category intents do the strategies support?
    B. Which strategies relate to the intents of more than one category?
    C. How do strategies work together to yield synergistic benefits?
4. The facilitator will stop you when 15 minutes have elapsed and initiate a discussion of the case study.

ACTIVITY 4

Directions
Worksheet
Content

STRATEGY	CREDIT CATEGORY ADDRESSED					
	Sustainable Sites	Water Efficiency	Energy & Atmosphere	Materials & Resources	Indoor Environmental Quality	Innovation in Design
Write strategy here...				X	X	

ACTIVITY 4

Directions
Worksheet
Content

STRATEGY	CREDIT CATEGORY ADDRESSED					
	Sustainable Sites	Water Efficiency	Energy & Atmosphere	Materials & Resources	Indoor Environmental Quality	Innovation in Design
Write strategy here...				X	X	

ACTIVITY 4

Directions
Worksheet
Content

CASE STUDY
BACKGROUND INFORMATION
GAIA NAPA VALLEY HOTEL

Overview

Photo by Bruce Schneider

Location: Canyon Valley, CA

Building Type: New construction

Square Footage: 90,000

Rating System: LEED for New Construction

Certification Level: Gold

The Gaia Napa Valley Hotel, owned by Butterfly Effect, is the first hotel in the United States to achieve a LEED Gold rating. This hotel has a lodge with 133 guest rooms; a reception building and conference center that contains meeting rooms; a kitchen; and a banquet room. The hotel also has a pool and offers spa services. Murals painted on the hotel walls depict the local wetlands and vineyards.

Gaia is the Greek name of the goddess Mother Earth. Early in the conceptual design phase of the Gaia hotel project, the developer and project team identified sustainable building design and construction goals for the project. The developer is committed to sustainable hotel development. One of his inspirations was Paul Hawken's book, "The Ecology of Commerce."

On the hotel site, a stormwater management plan has been implemented to reduce the impact on the community stormwater system and improve the performance over that of pre-development conditions. Roof surface water is collected and diverted to a central lagoon and then used to help irrigate the courtyard landscaping. The landscape plantings are native or climate-adaptive, and no chemicals are used. The koi pond uses recycled water from the site, which is then filtered and cleaned prior to entering the pond.

The frontage of the entire site, exclusive of the entry drive, has been reconfigured into a series of bioswales and berms with an underdrain system and additional storage capacity, so that virtually no runoff leaves the site.

A 36-kW solar array supplies 10% of the electrical demand of the building's energy-efficient HVAC units. The roof is also made of a cool reflective material. All windows

used are efficient and low energy transmittable; reduce glare; and are operable, allowing for natural ventilation.

Aluminum exterior grates were used in all entrances of the property, helping to minimize dust and particulates entering the building.

FSC-certified wood was used for lumber, doors, hallway trim and lobby beams. All restrooms contain recycled tiles and granite.

Construction waste was recycled to divert it from the landfill. The contractor provided a recycling station for cardboard, and all cardboard was recycled on the premises. The contractor also set up an on-site paint recycling station to collect unused paint that was then taken off-site to be recycled.

Recycling bins are located in guestrooms and around the property. Newspapers are not delivered to each occupied room, but instead are located in the lobby, available for guests who actually read them. Only recycled paper products are used throughout the hotel, and environmentally friendly cleaning materials are used.

Additional green building strategies used by Gaia Hotel:

- Water conservation is achieved through efficient plumbing fixtures and irrigation systems, reducing water consumption by more than 40%.
- All hotel guest rooms are equipped with low-flow showerheads and low-flush toilets. Bulk soap and shower dispensers are used in all guest rooms, helping to eliminate hundreds of pounds of plastic containers and packaging daily from mini shower bottles and soap.
- Tubular skylights bring daylight into hallways and other spaces in the interior core and reduce the lighting demand in these spaces.
- The project is estimated to have energy savings of 24.9% beyond ASHRAE 90.1-1999 (and California's Title 24 requirements).
- Low-VOC adhesives, sealants, paints and carpets used in the project are certified to meet emissions standards for indoor air quality.
- The carpets contain post-consumer recycled material in the backing, fiber and pad.
- Salvaged construction materials were used when possible, and new materials were selected for their recycled content and regional availability.
- A kiosk in the hotel lobby displays the building's water and energy use, and resulting CO_2 emissions, in real time, and features an interactive computer screen on which visitors can learn more about the hotel's LEED strategies.

Case story courtesy of Gaia Napa Valley Hotel & Spa

APPENDIX A

LEED 2009 for New Construction and Major Renovations Checklist

LEED 2009 for New Construction and Major Renovation

Project Checklist

Project Name

Date

Y	N	?				
			Sustainable Sites		Possible Points:	**26**
Y			Prereq 1	Construction Activity Pollution Prevention		
			Credit 1	Site Selection	1	
			Credit 2	Development Density and Community Connectivity	5	
			Credit 3	Brownfield Redevelopment	1	
			Credit 4.1	Alternative Transportation—Public Transportation Access	6	
			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1	
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3	
			Credit 4.4	Alternative Transportation—Parking Capacity	2	
			Credit 5.1	Site Development—Protect or Restore Habitat	1	
			Credit 5.2	Site Development—Maximize Open Space	1	
			Credit 6.1	Stormwater Design—Quantity Control	1	
			Credit 6.2	Stormwater Design—Quality Control	1	
			Credit 7.1	Heat Island Effect—Non-roof	1	
			Credit 7.2	Heat Island Effect—Roof	1	
			Credit 8	Light Pollution Reduction	1	
			Water Efficiency		Possible Points:	**10**
Y			Prereq 1	Water Use Reduction—20% Reduction		
			Credit 1	Water Efficient Landscaping	2 to 4	
			Credit 2	Innovative Wastewater Technologies	2	
			Credit 3	Water Use Reduction	2 to 4	
			Energy and Atmosphere		Possible Points:	**35**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems		
Y			Prereq 2	Minimum Energy Performance		
Y			Prereq 3	Fundamental Refrigerant Management		
			Credit 1	Optimize Energy Performance	1 to 19	
			Credit 2	On-Site Renewable Energy	1 to 7	
			Credit 3	Enhanced Commissioning	2	
			Credit 4	Enhanced Refrigerant Management	2	
			Credit 5	Measurement and Verification	3	
			Credit 6	Green Power	2	
			Materials and Resources		Possible Points:	**14**
Y			Prereq 1	Storage and Collection of Recyclables		
			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3	
			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1	
			Credit 2	Construction Waste Management	1 to 2	
			Credit 3	Materials Reuse	1 to 2	
			Materials and Resources, Continued			
			Credit 4	Recycled Content	1 to 2	
			Credit 5	Regional Materials	1 to 2	
			Credit 6	Rapidly Renewable Materials	1	
			Credit 7	Certified Wood	1	
			Indoor Environmental Quality		Possible Points:	**15**
Y			Prereq 1	Minimum Indoor Air Quality Performance		
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control		
			Credit 1	Outdoor Air Delivery Monitoring	1	
			Credit 2	Increased Ventilation	1	
			Credit 3.1	Construction IAQ Management Plan—During Construction	1	
			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1	
			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1	
			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1	
			Credit 4.3	Low-Emitting Materials—Flooring Systems	1	
			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1	
			Credit 5	Indoor Chemical and Pollutant Source Control	1	
			Credit 6.1	Controllability of Systems—Lighting	1	
			Credit 6.2	Controllability of Systems—Thermal Comfort	1	
			Credit 7.1	Thermal Comfort—Design	1	
			Credit 7.2	Thermal Comfort—Verification	1	
			Credit 8.1	Daylight and Views—Daylight	1	
			Credit 8.2	Daylight and Views—Views	1	
			Innovation and Design Process		Possible Points:	**6**
			Credit 1.1	Innovation in Design: Specific Title	1	
			Credit 1.2	Innovation in Design: Specific Title	1	
			Credit 1.3	Innovation in Design: Specific Title	1	
			Credit 1.4	Innovation in Design: Specific Title	1	
			Credit 1.5	Innovation in Design: Specific Title	1	
			Credit 2	LEED Accredited Professional	1	
			Regional Priority Credits		Possible Points:	**4**
			Credit 1.1	Regional Priority: Specific Credit	1	
			Credit 1.2	Regional Priority: Specific Credit	1	
			Credit 1.3	Regional Priority: Specific Credit	1	
			Credit 1.4	Regional Priority: Specific Credit	1	
			Total		Possible Points:	**110**

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

APPENDIX B

LEED 2009 for Core & Shell Development Checklist

LEED 2009 for Core and Shell Development

Project Checklist

Project Name

Date

Sustainable Sites — Possible Points: 28

Y	N	?			
Y			Prereq 1	Construction Activity Pollution Prevention	
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	5
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation—Public Transportation Access	6
			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	2
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
			Credit 4.4	Alternative Transportation—Parking Capacity	2
			Credit 5.1	Site Development—Protect or Restore Habitat	1
			Credit 5.2	Site Development—Maximize Open Space	1
			Credit 6.1	Stormwater Design—Quantity Control	1
			Credit 6.2	Stormwater Design—Quality Control	1
			Credit 7.1	Heat Island Effect—Non-roof	1
			Credit 7.2	Heat Island Effect—Roof	1
			Credit 8	Light Pollution Reduction	1
			Credit 9	Tenant Design and Construction Guidelines	1

Water Efficiency — Possible Points: 10

Y			Prereq 1	Water Use Reduction—20% Reduction	
			Credit 1	Water Efficient Landscaping	2 to 4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 37

Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
			Credit 1	Optimize Energy Performance	3 to 21
			Credit 2	On-Site Renewable Energy	4
			Credit 3	Enhanced Commissioning	2
			Credit 4	Enhanced Refrigerant Management	2
			Credit 5.1	Measurement and Verification—Base Building	3
			Credit 5.2	Measurement and Verification—Tenant Submetering	3
			Credit 6	Green Power	2

Materials and Resources — Possible Points: 13

Y	N	?			
Y			Prereq 1	Storage and Collection of Recyclables	
			Credit 1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 5
			Credit 2	Construction Waste Management	1 to 2
			Credit 3	Materials Reuse	1
			Credit 4	Recycled Content	1 to 2
			Credit 5	Regional Materials	1 to 2
			Credit 6	Certified Wood	1

Indoor Environmental Quality — Possible Points: 12

Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
			Credit 1	Outdoor Air Delivery Monitoring	1
			Credit 2	Increased Ventilation	1
			Credit 3	Construction IAQ Management Plan—During Construction	1
			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
			Credit 5	Indoor Chemical and Pollutant Source Control	1
			Credit 6	Controllability of Systems—Thermal Comfort	1
			Credit 7	Thermal Comfort—Design	1
			Credit 8.1	Daylight and Views—Daylight	1
			Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

			Credit 1.1	Innovation in Design: Specific Title	1
			Credit 1.2	Innovation in Design: Specific Title	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 1.5	Innovation in Design: Specific Title	1
			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1

Total — Possible Points: 110

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

APPENDIX C

LEED 2009 for Schools New Construction and Major Renovations Checklist

LEED 2009 for Schools New Construction and Major Renovation

Project Checklist

Project Name

Date

Y	N	?			
			Sustainable Sites	**Possible Points:**	**24**
Y			Prereq 1	Construction Activity Pollution Prevention	
			Prereq 1	Environmental Site Assessment	
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	4
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation—Public Transportation Access	4
			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	2
			Credit 4.4	Alternative Transportation—Parking Capacity	2
			Credit 5.1	Site Development—Protect or Restore Habitat	1
			Credit 5.2	Site Development—Maximize Open Space	1
			Credit 6.1	Stormwater Design—Quantity Control	1
			Credit 6.2	Stormwater Design—Quality Control	1
			Credit 7.1	Heat Island Effect—Non-roof	1
			Credit 7.2	Heat Island Effect—Roof	1
			Credit 8	Light Pollution Reduction	1
			Credit 9	Site Master Plan	1
			Credit 10	Joint Use of Facilities	1
			Water Efficiency	**Possible Points:**	**11**
Y			Prereq 1	Water Use Reduction—20% Reduction	
			Credit 1	Water Efficient Landscaping	2 to 4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4
			Credit 3	Process Water Use Reduction	1
			Energy and Atmosphere	**Possible Points:**	**33**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
			Credit 1	Optimize Energy Performance	1 to 19
			Credit 2	On-Site Renewable Energy	1 to 7
			Credit 3	Enhanced Commissioning	2
			Credit 4	Enhanced Refrigerant Management	1
			Credit 5	Measurement and Verification	2
			Credit 6	Green Power	2
			Materials and Resources	**Possible Points:**	**13**
Y			Prereq 1	Storage and Collection of Recyclables	
			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 2
			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
			Credit 2	Construction Waste Management	1 to 2

Y	N	?			
			Materials and Resources, Continued		
			Credit 3	Materials Reuse	1 to 2
			Credit 4	Recycled Content	1 to 2
			Credit 5	Regional Materials	1 to 2
			Credit 6	Rapidly Renewable Materials	1
			Credit 7	Certified Wood	1
			Indoor Environmental Quality	**Possible Points:**	**19**
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Minimum Acoustical Performance	
			Credit 1	Outdoor Air Delivery Monitoring	1
			Credit 2	Increased Ventilation	1
			Credit 3.1	Construction IAQ Management Plan—During Construction	1
			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
			Credit 4	Low-Emitting Materials	1 to 4
			Credit 5	Indoor Chemical and Pollutant Source Control	1
			Credit 6.1	Controllability of Systems—Lighting	1
			Credit 6.2	Controllability of Systems—Thermal Comfort	1
			Credit 7.1	Thermal Comfort—Design	1
			Credit 7.2	Thermal Comfort—Verification	1
			Credit 8.1	Daylight and Views—Daylight	1 to 3
			Credit 8.2	Daylight and Views—Views	1
			Credit 9	Enhanced Acoustical Performance	1
			Credit 10	Mold Prevention	1
			Innovation and Design Process	**Possible Points:**	**6**
			Credit 1.1	Innovation in Design: Specific Title	1
			Credit 1.2	Innovation in Design: Specific Title	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 2	LEED Accredited Professional	1
			Credit 3	The School as a Teaching Tool	1
			Regional Priority Credits	**Possible Points:**	**4**
			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1
			Total	**Possible Points:**	**110**

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

APPENDIX D

LEED 2009 for Existing Buildings: Operations & Maintenance Checklist

LEED 2009 for Existing Buildings: Operations & Maintenance

Project Checklist

Project Name

Date

Sustainable Sites — Possible Points: 26

Y	N	?			
			Credit 1	LEED Certified Design and Construction	4
			Credit 2	Building Exterior and Hardscape Management Plan	1
			Credit 3	Integrated Pest Mgmt, Erosion Control, and Landscape Mgmt Plan	1
			Credit 4	Alternative Commuting Transportation	3 to 15
			Credit 5	Site Development—Protect or Restore Open Habitat	1
			Credit 6	Stormwater Quantity Control	1
			Credit 7.1	Heat Island Reduction—Non-Roof	1
			Credit 7.2	Heat Island Reduction—Roof	1
			Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 14

Y			Prereq 1	Minimum Indoor Plumbing Fixture and Fitting Efficiency	
			Credit 1	Water Performance Measurement	1 to 2
			Credit 1	Additional Indoor Plumbing Fixture and Fitting Efficiency	1 to 5
			Credit 1	Water Efficient Landscaping	1 to 5
			Credit 1	Cooling Tower Water Management—Chemical Management	1
			Credit 1	Cooling Tower Water Management—Non-Potable Water Source Use	1

Energy and Atmosphere — Possible Points: 35

Y			Prereq 1	Energy Efficiency Best Management Practices	
Y			Prereq 2	Minimum Energy Efficiency Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
			Credit 1	Optimize Energy Efficiency Performance	1 to 18
			Credit 2.1	Existing Building Commissioning—Investigation and Analysis	2
			Credit 2.2	Existing Building Commissioning—Implementation	2
			Credit 2.3	Existing Building Commissioning—Ongoing Commissioning	2
			Credit 3.1	Performance Measurement—Building Automation System	1
			Credit 3.2	Performance Measurement—System-Level Metering	1 to 2
			Credit 4	On-site and Off-site Renewable Energy	1 to 6
			Credit 5	Enhanced Refrigerant Management	1
			Credit 6	Emissions Reduction Reporting	1

Materials and Resources — Possible Points: 10

Y			Prereq 1	Sustainable Purchasing Policy	
Y			Prereq 2	Solid Waste Management Policy	
			Credit 1	Sustainable Purchasing—Ongoing Consumables	1
			Credit 2.1	Sustainable Purchasing—Electric	1
			Credit 2.2	Sustainable Purchasing—Furniture	1
			Credit 3	Sustainable Purchasing—Facility Alterations and Additions	1
			Credit 4	Sustainable Purchasing—Reduced Mercury in Lamps	1
			Credit 5	Sustainable Purchasing—Food	1

Materials and Resources, Continued

Y	N	?			
			Credit 6	Solid Waste Management—Waste Stream Audit	1
			Credit 7	Solid Waste Management—Ongoing Consumables	1
			Credit 8	Solid Waste Management—Durable Goods	1
			Credit 9	Solid Waste Management—Facility Alterations and Additions	1

Indoor Environmental Quality — Possible Points: 15

Y			Prereq 1	Minimum IAQ Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Green Cleaning Policy	
			Credit 1.1	IAQ Best Mgmt Practices—IAQ Management Program	1
			Credit 1.2	IAQ Best Mgmt Practices—Outdoor Air	1
			Credit 1.3	IAQ Best Mgmt Practices—Increased Ventilation	1
			Credit 1.4	IAQ Best Mgmt Practices—Reduce Particulates in Air Distribution	1
			Credit 1.5	IAQ Mgmt Plan—IAQ Mgmt for Facility Alterations and Additions	1
			Credit 2.1	Occupant Comfort—Occupant Survey	1
			Credit 2.2	Controllability of Systems—Lighting	1
			Credit 2.3	Occupant Comfort—Thermal Comfort Monitoring	1
			Credit 2.4	Daylight and Views	1
			Credit 3.1	Green Cleaning—High Performance Cleaning Program	1
			Credit 3.2	Green Cleaning—Custodial Effectiveness Assessment	1
			Credit 3.3	Green Cleaning—Sustainable Cleaning Products, Materials Purchases	1
			Credit 3.4	Green Cleaning—Sustainable Cleaning Equipment	1
			Credit 3.5	Green Cleaning—Indoor Chemical and Pollutant Source Control	1
			Credit 3.6	Green Cleaning—Indoor Integrated Pest Management	1

Innovation in Operations — Possible Points: 6

			Credit 1.1	Innovation in Operations: Specific Title	1
			Credit 1.2	Innovation in Operations: Specific Title	1
			Credit 1.3	Innovation in Operations: Specific Title	1
			Credit 1.4	Innovation in Operations: Specific Title	1
			Credit 2	LEED Accredited Professional	1
			Credit 3	Documenting Sustainable Building Cost Impacts	1

Regional Priority Credits — Possible Points: 4

			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1

Total — Possible Points: 110

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

APPENDIX E

LEED 2009 for Commercial Interiors Checklist

LEED 2009 for Commercial Interiors

Project Checklist

Project Name

Date

Y	N	?				
			Sustainable Sites		Possible Points:	**21**
			Credit 1	Site Selection		1 to 5
			Credit 2	Development Density and Community Connectivity		6
			Credit 3.1	Alternative Transportation—Public Transportation Access		6
			Credit 3.2	Alternative Transportation—Bicycle Storage and Changing Rooms		2
			Credit 3.3	Alternative Transportation—Parking Availability		2
			Water Efficiency		Possible Points:	**11**
Y			Prereq 1	Water Use Reduction—20% Reduction		
			Credit 1	Water Use Reduction		6 to 11
			Energy and Atmosphere		Possible Points:	**37**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems		
Y			Prereq 2	Minimum Energy Performance		
Y			Prereq 3	Fundamental Refrigerant Management		
			Credit 1.1	Optimize Energy Performance—Lighting Power		1 to 5
			Credit 1.2	Optimize Energy Performance—Lighting Controls		1 to 3
			Credit 1.3	Optimize Energy Performance—HVAC		5 to 10
			Credit 1.4	Optimize Energy Performance—Equipment and Appliances		1 to 4
			Credit 2	Enhanced Commissioning		5
			Credit 3	Measurement and Verification		2 to 5
			Credit 4	Green Power		5
			Materials and Resources		Possible Points:	**14**
Y			Prereq 1	Storage and Collection of Recyclables		
			Credit 1.1	Tenant Space—Long-Term Commitment		1
			Credit 1.2	Building Reuse		1 to 2
			Credit 2	Construction Waste Management		1 to 2
			Credit 3.1	Materials Reuse		1 to 2
			Credit 3.2	Materials Reuse—Furniture and Furnishings		1
			Credit 4	Recycled Content		1 to 2
			Credit 5	Regional Materials		1 to 2
			Credit 6	Rapidly Renewable Materials		1
			Credit 7	Certified Wood		1

Y	N	?				
			Indoor Environmental Quality		Possible Points:	**17**
Y			Prereq 1	Minimum IAQ Performance		
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control		
			Credit 1	Outdoor Air Delivery Monitoring		1
			Credit 2	Increased Ventilation		1
			Credit 3.1	Construction IAQ Management Plan—During Construction		1
			Credit 3.2	Construction IAQ Management Plan—Before Occupancy		1
			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants		1
			Credit 4.2	Low-Emitting Materials—Paints and Coatings		1
			Credit 4.3	Low-Emitting Materials—Flooring Systems		1
			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products		1
			Credit 4.5	Low-Emitting Materials—Systems Furniture and Seating		1
			Credit 5	Indoor Chemical & Pollutant Source Control		1
			Credit 6.1	Controllability of Systems—Lighting		1
			Credit 6.2	Controllability of Systems—Thermal Comfort		1
			Credit 7.1	Thermal Comfort—Design		1
			Credit 7.2	Thermal Comfort—Verification		1
			Credit 8.1	Daylight and Views—Daylight		1 to 2
			Credit 8.2	Daylight and Views—Views for Seated Spaces		1
			Innovation and Design Process		Possible Points:	**6**
			Credit 1.1	Innovation in Design: Specific Title		1
			Credit 1.2	Innovation in Design: Specific Title		1
			Credit 1.3	Innovation in Design: Specific Title		1
			Credit 1.4	Innovation in Design: Specific Title		1
			Credit 1.5	Innovation in Design: Specific Title		1
			Credit 2	LEED Accredited Professional		1
			Regional Priority Credits		Possible Points:	**4**
			Credit 1.1	Regional Priority: Specific Credit		1
			Credit 1.2	Regional Priority: Specific Credit		1
			Credit 1.3	Regional Priority: Specific Credit		1
			Credit 1.4	Regional Priority: Specific Credit		1
			Total		Possible Points:	**110**

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

APPENDIX F

LEED 2009 for Homes Project Checklist - page 1

LEED for Homes Project Checklist

for Homes

Builder Name:	
Project Team Leader:	
Home Address (Street/City/State):	

Project Description

Building Type: Project type:

# of Bedrooms: *0* Floor Area: *0*

Adjusted Certification Thresholds

Certified: *45.0* Gold: *75.0*

Silver: *60.0* Platinum: *90.0*

Project Point Total

Prelim: *0 + 0 maybe pts* Final: *0*

Certification Level

Prelim: *Not Certified* Final: *Not Certified*

Final Credit Category Point Totals

ID: 0 *SS: 0* *EA: 0* *EQ: 0*

LL: 0 *WE: 0* *MR: 0* *AE: 0*

Min. Point Thresholds Not Met for Prelim. OR Final Rating

Date Most Recently Updated: *Updated by:*

✍ Indicates that an Accountability Form is required.

	Max Pts. Available	Preliminary Rating Y / Pts	Maybe	No	Notes	Project Points
Innovation & Design Process (ID) (Minimum 0 ID Points Required)	*Max: 11*	*Y:0*	*M:0*			*Final: 0*
1. Integrated Project Planning						
1.1 Preliminary Rating	*Prereq.*					
Target performance tier:						
1.2 Integrated Project Team *(meet all of the following)*	*1*	*0*	*0*			*0*
☐ a) Individuals or organizations with necessary capabilities	☐ c) Regular meetings held with project team					
☐ b) All team members involved in various project phases						
1.3 Professional Credentialed with Respect to LEED for Homes	*1*	*0*	*0*		*please see ID 01-06 for details*	*0*
1.4 Design Charrette	*1*	*0*	*0*			*0*
1.5 Building Orientation for Solar Design *(meet all of the following)*	*1*	*0*	*0*			*0*
☐ a) Glazing area on north/south walls 50% greater than on east/west walls	☐ c) At least 450 sq. ft. of south-facing roof area, oriented for solar applications					
☐ b) East-west axis is within 15 degrees of due east-west	☐ d) 90% of south-facing glazing is shaded in summer, unshaded in winter					
2. Quality Management for Durability						
2.1 Durability Planning *(meet all of the following)*	*Prereq.*					
☐ a) Durability evaluation completed	☐ d) Durability strategies incorporated into project documentation					
☐ b) Strategies developed to address durability issues	☐ e) Durability measures listed in durability inspection checklist					
☐ c) Moisture control measures from Table 1 incorporated						
2.2 Durability Management *(meet one of the following)*	*Prereq.*					
☐ Builder has a quality management process in place	☐ Builder conducted inspection using durability inspection checklist					
2.3 Third-Party Durability Management Verification	*3*	*0*	*0*			*0*

APPENDIX F

LEED 2009 for Homes Project Checklist - page 2

3. Innovative or Regional Design						
3.1	✍ Innovation 1 (ruling #):	1	0	0		0
3.2	✍ Innovation 2 (ruling #):	1	0	0		0
3.3	✍ Innovation 3 (ruling #):	1	0	0		0
3.4	✍ Innovation 4 (ruling #):	1	0	0		0
Location & Linkages (LL)	(Minimum 0 LL Points Required)	**Max: 10**	**Y:0**	**M:0**	**Notes**	**Final: 0**
1. LEED for Neighborhood Development						
1	LEED for Neighborhood Development	10	0	0		0
2. Site Selection						
2	✍ Site Selection *(meet all of the following)*	2	0	0		0
	☐ a) Built above 100-year floodplain defined by FEMA	☐ d) Not built on land that was public parkland prior to acquisition				
	☐ b) Not built on habitat for threatened or endangered species	☐ e) Not built on land with prime soils, unique soils, or soils of state significance				
	☐ c) Not built within 100 ft of water, including wetlands					
3. Preferred Locations						
3.1	Edge Development	1	0	0		0
OR 3.2	Infill	2	0	0		0
AND/OR 3.3	Previously Developed	1	0	0		0
4. Infrastructure						
4	Existing Infrastructure	1	0	0		0
5. Community Resources / Transit						
5.1	Basic Community Resources / Transit *(meet one of the following)*	1	0	0		0
	☐ a) Within 1/4 mile of 4 basic community resources	☐ c) Within 1/2 mile of transit services providing 30 rides per weekday				
	☐ b) Within 1/2 mile of 7 basic community resources					
OR 5.2	Extensive Community Resources / Transit *(meet one of the following)*	2	0	0		0
	☐ a) Within 1/4 mile of 7 basic community resources	☐ c) Within 1/2 mile of transit services providing 60 rides per weekday				
	☐ b) Within 1/2 mile of 11 basic community resources					
OR 5.3	Outstanding Community Resources / Transit *(meet one of the following)*	3	0	0		0
	☐ a) Within 1/4 mile of 11 basic community resources	☐ c) Within 1/2 mile of transit services providing 125 rides per weekday				
	☐ b) Within 1/2 mile of 14 basic community resources					
6. Access to Open Space						
6	Access to Open Space	1	0	0		0

APPENDIX G

LEED 2009 for Neighborhood Development Checklist

LEED 2009 for Neighborhood Development
Project Checklist

Project Name:
Date:

Yes	?	No			
0	0	0	**Smart Location and Linkage**		27 Points Possible
Y			Prereq 1	Smart Location	Required
Y			Prereq 2	Imperiled Species and Ecological Communities	Required
Y			Prereq 3	Wetland and Water Body Conservation	Required
Y			Prereq 4	Agricultural Land Conservation	Required
Y			Prereq 5	Floodplain Avoidance	Required
			Credit 1	Preferred Locations	10
			Credit 2	Brownfield Redevelopment	2
			Credit 3	Locations with Reduced Automobile Dependence	7
			Credit 4	Bicycle Network and Storage	1
			Credit 5	Housing and Jobs Proximity	3
			Credit 6	Steep Slope Protection	1
			Credit 7	Site Design for Habitat or Wetland and Water Body Conservation	1
			Credit 8	Restoration of Habitat or Wetlands and Water Bodies	1
			Credit 9	Long-Term Conservation Management of Habitat or Wetlands and Water Bodies	1

Yes	?	No			
0	0	0	**Neighborhood Pattern and Design**		44 Points Possible
Y			Prereq 1	Walkable Streets	Required
Y			Prereq 2	Compact Development	Required
Y			Prereq 3	Connected and Open Community	Required
			Credit 1	Walkable Streets	12
			Credit 2	Compact Development	6
			Credit 3	Mixed-Use Neighborhood Centers	4
			Credit 4	Mixed-Income Diverse Communities	7
			Credit 5	Reduced Parking Footprint	1
			Credit 6	Street Network	2
			Credit 7	Transit Facilities	1
			Credit 8	Transportation Demand Management	2
			Credit 9	Access to Civic and Public Spaces	1
			Credit 10	Access to Recreation Facilities	1
			Credit 11	Visitability and Universal Design	1
			Credit 12	Community Outreach and Involvement	2
			Credit 13	Local Food Production	1
			Credit 14	Tree-Lined and Shaded Streets	2
			Credit 15	Neighborhood Schools	1

Yes	?	No			
0	0	0	**Green Infrastructure and Buildings**		29 Points Possible
Y			Prereq 1	Certified Green Building	Required
Y			Prereq 2	Minimum Building Energy Efficiency	Required
Y			Prereq 3	Minimum Building Water Efficiency	Required
Y			Prereq 4	Construction Activity Pollution Prevention	Required

Green Infrastructure and Buildings, Continued

Yes	?	No			
			Credit 1	Certified Green Buildings	5
			Credit 2	Building Energy Efficiency	2
			Credit 3	Building Water Efficiency	1
			Credit 4	Water-Efficient Landscaping	1
			Credit 5	Existing Building Use	1
			Credit 6	Historic Resource Preservation and Adaptive Reuse	1
			Credit 7	Minimized Site Disturbance in Design and Construction	1
			Credit 8	Stormwater Management	4
			Credit 9	Heat Island Reduction	1
			Credit 10	Solar Orientation	1
			Credit 11	On-Site Renewable Energy Sources	3
			Credit 12	District Heating and Cooling	2
			Credit 13	Infrastructure Energy Efficiency	1
			Credit 14	Wastewater Management	2
			Credit 15	Recycled Content in Infrastructure	1
			Credit 16	Solid Waste Management Infrastructure	1
			Credit 17	Light Pollution Reduction	1

Yes	?	No			
0	0	0	**Innovation and Design Process**		6 Points
			Credit 1.1	Innovation and Exemplary Performance: Provide Specific Title	1
			Credit 1.2	Innovation and Exemplary Performance: Provide Specific Title	1
			Credit 1.3	Innovation and Exemplary Performance: Provide Specific Title	1
			Credit 1.4	Innovation and Exemplary Performance: Provide Specific Title	1
			Credit 1.5	Innovation and Exemplary Performance: Provide Specific Title	1
			Credit 2	LEED® Accredited Professional	1

Yes	?	No			
0	0	0	**Regional Priority Credit**		4 Points
			Credit 1.1	Regional Priority Credit: Region Defined	1
			Credit 1.2	Regional Priority Credit: Region Defined	1
			Credit 1.3	Regional Priority Credit: Region Defined	1
			Credit 1.4	Regional Priority Credit: Region Defined	1

Yes	?	No		
0	0	0	**Project Totals (Certification estimates)**	110 Points

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

GLOSSARY

Acid Rain
The precipitation of dilute solutions of strong mineral acids, formed by the mixing in the atmosphere of various industrial pollutants (primarily sulfur dioxide and nitrogen oxides) with naturally occurring oxygen and water vapor.

Air Quality Standards
The level of pollutants prescribed by regulations that are not to be exceeded during a given time in a defined area. (EPA)

Airborne Particulates
Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include: dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts and reactions to gases in the atmosphere. (EPA)

Albedo
Albedo, or **solar reflectance,** is a measure of the ability of a surface material to reflect sunlight—visible, infrared, and ultraviolet wavelengths—on a scale of 0 to 1. Solar reflectance is also called albedo. Black paint has a solar reflectance of 0; white paint (titanium dioxide) has a solar reflectance of 1.

Alternative Fuel Vehicles
Vehicles that use low-polluting, non-gasoline fuels such as electricity, hydrogen, propane or compressed natural gas, liquid natural gas, methanol and ethanol. Efficient gas-electric hybrid vehicles are included in this group for LEED purposes.

Ambient Temperature
Temperature of the surrounding air or other medium. (EPA)

ASHRAE
American Society of Heating, Refrigeration and Air Conditioning Engineers

Bake-Out
A process used to remove volatile organic compounds (VOCs) from a building by elevating the temperature in the fully furnished and ventilated building prior to human occupancy.

Biodegradable
Capable of decomposing under natural conditions. (EPA)

Biodiversity
The variety of life in all forms, levels and combinations, including ecosystem diversity, species diversity and genetic diversity.

Biomass
Plant material such as trees, grasses and crops that can be converted to heat energy to produce electricity.

Blackwater
Does not have a single definition accepted nationwide. Wastewater from toilets and urinals is, however, always considered blackwater. Wastewater from kitchen sinks (perhaps differentiated by the use of a garbage disposal), showers, or bathtubs may be considered blackwater by state or local codes. Project teams should comply with the blackwater definition as established by the authority having jurisdiction in their areas.

Brownfields
Abandoned, idled or under-used industrial and commercial facilities/sites where expansion or redevelopment is complicated by real or perceived environmental contamination. They can be in urban, suburban or rural areas. EPA's Brownfields initiative helps communities mitigate potential health risks and restore the economic vitality of such areas or properties. (EPA)

GLOSSARY

Building Density
The floor area of the building divided by the total area of the site (square feet per acre).

Building Envelope
The exterior surface of a building's construction – the walls, windows, roof and floor. Also referred to as the "building shell."

Building Footprint
The area on a project site that is used by the building structure and is defined by the perimeter of the building plan. Parking lots, landscapes and other non-building facilities are not included in the building footprint.

Byproduct
Material, other than the principal product, generated as a consequence of an industrial process or as a breakdown product in a living system. (EPA)

Commissioning (CX)
The process of ensuring that systems are designed, installed, functionally tested and capable of being operated and maintained to perform in conformity with the owner's project requirements.

Commissioning Plan
A document defining the commissioning process, which is developed in increasing detail as the project progresses through its various phases.

Commissioning Report
The document that records the results of the commissioning process, including the as-built performance of the HVAC system and unresolved issues.

Compact Fluorescent Lamp (CFL)
Small fluorescent lamps used as more efficient alternatives to incandescent lighting. Also called PL, CFL, Twin-Tube or BIAX lamps. (EPA)

Conservation
Preserving and renewing, when possible, human and natural resources. The use, protection and improvement of natural resources according to principles that will ensure their highest economic or social benefits. (EPA)

Construction and Demolition Debris
Includes waste and recyclables generated from construction, renovation, and demolition or deconstruction of pre-existing structures. Land clearing debris including soil, vegetation, rocks, etc. are not to be included.

Construction Waste Management Plan (CWMP)
A plan that diverts construction debris from landfills through the processes of recycling, salvaging and reusing.

Contaminant
An unwanted airborne constituent that may reduce acceptability of the air. (ASHRAE 62.1 – 2004).

Daylighting
The controlled admission of natural light into a space through glazing with the intent of reducing or eliminating electric lighting. By utilizing solar light, daylighting creates a stimulating and productive environment for building occupants.

Ecosystem
A basic unit of nature that includes a community of organisms and their non-living environment linked by biological, chemical and physical process.

GLOSSARY

Energy Efficient
Products and systems that use less energy to perform as well or better than standard products.

Energy Management System
A control system capable of monitoring environmental and system loads and adjusting HVAC operations accordingly in order to conserve energy while maintaining comfort. (EPA)

ENERGY STAR Rating
The designation given by the EPA and the U.S. Department of Energy to appliances and products that exceed federal energy efficiency standards. This label helps consumers identify products that will save energy and money.

Environmental Sustainability
Long-term maintenance of ecosystem components and functions for future generations. (EPA)

Eutrophication
The increase in chemical nutrients, such as the nitrogen and phosphorus often found in fertilizers, in an ecosystem. The added nutrients stimulate excessive plant growth, promoting algal blooms or weeds. The enhanced plant growth reduces oxygen in the land and water, reducing water quality and fish and other animal populations.

Flush Out
The operation of mechanical systems for a minimum of two weeks using 100 percent outside air at the end of construction and prior to building occupancy to ensure safe indoor air quality.

Fossil Fuels
Fuel derived from ancient organic remains; e.g. peat, coal, crude oil, and natural gas. (EPA)

Graywater
Domestic wastewater composed of wash water from kitchen, bathroom, and laundry sinks, tubs, and washers. (EPA)

Harvested Rainwater
Rainwater captured and used for indoor needs, irrigation, or both.

Heat Island Effect
Occurs when warmer temperatures are experienced in urban landscapes compared to adjacent rural areas as a result of solar energy retention on constructed surfaces. Principal surfaces that contribute to the heat island effect include streets, sidewalks, parking lots and buildings.

High Performance Green Building
Buildings which include design features that conserve water and energy; use space, materials and resources efficiently; minimize construction waste; and create healthy indoor environments.

HVAC Systems
Include heating, ventilating and air-conditioning systems used to provide thermal comfort and ventilation for building interiors.

Indoor Air Quality
The nature of air inside a space that affects the health and well-being of building occupants.

Integrated Design Team
The team of all individuals involved in a project from very early in the design process, including the design professionals, the owner's representatives and the general contractor and subcontractors.

LEED Category
LEED Rating System™ component. Each LEED® prerequisite and credit falls within one of several categories.

GLOSSARY

LEED Credit
LEED Green Building Rating System™ component. Compliance is optional and meeting credit criteria results in the earning of points toward certification.

Credit Interpretation Ruling (CIR)
The project Credit Interpretation Ruling (CIR) and request process is designed to allow project teams to obtain technical and administrative guidance on how LEED® requirements – including Minimum Program Requirements, prerequisites, and credits – pertain to their projects.

Intent
LEED Rating Systemä component. Identifies the primary goal of each prerequisite or credit.

LEED® Rating System™
The Leadership in Energy and Environmental Design (LEED®) Rating System™ sets industry standards for green building design. It is a voluntary, consensus-based, market driven building rating system based on existing proven technology. The LEED Rating System™ represents USGBC's effort to provide a national benchmark for what constitutes a green building. Through its use as a design guideline and third-party certification tool, the LEED Rating System aims to improve occupant well-being, environmental performance and economic returns of building using established and innovative practices, standards and technologies.

LEED Points
Compliance with each LEED credit earns one or more points toward certification. Compliance with prerequisites is required and does not earn points.

LEED Prerequisites
LEED Rating System component. Compliance is mandatory for achieving certification but does not count toward the accumulation of points.

LEED Requirements and Submittals
LEED Rating System component that specifies the criteria to satisfy the prerequisites or credit, the total number of points available and the documentation required for the LEED application.

LEED Technical Advisory Groups (TAG)
Subcommittees that consist of industry experts who assist in developing credit interpretations and technical improvements to the LEED system.

Life-Cycle Analysis (LCA)
An evaluation of the environmental effects of a product or activity holistically, by analyzing the entire life cycle of a particular material, process, product, technology, service or activity.

Non-Renewable
Of or relating to an energy source, such as oil or natural gas, or a natural resource, such as a metallic ore, that is not replaceable after it has been used.

Off-gassing
The emission of volatile organic compounds from synthetic and natural products.

Perviousness
The percent of the surface area of a paving material that is open and allows moisture to pass through the material and soak into the earth below the paving system.

Photovoltaic (PV)
Capable of producing a voltage when exposed to radiant energy, especially light, using photocells.

Pollutant
Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems. (EPA)

GLOSSARY

Pollution
Generally, the presence of a substance in the environment that, because of its chemical composition or quantity, prevents the functioning of natural processes and produces undesirable environmental and health effects. (EPA)

Post-consumer
Waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of materials from the distribution chain (source: ISO 14021). Examples of this category include construction and demolition debris, materials collected through curbside and drop-off recycling programs, broken pallets (if from a pallet refurbishing company, not a pallet-making company), discarded products (e.g., furniture, cabinetry and decking) and urban maintenance waste (e.g., leaves, grass clippings, tree trimmings, etc.).

Potable Water
Water suitable for drinking and supplied from wells or municipal water systems.

Pre-consumer Content
Defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it (source ISO 14021). Examples in this category include planer shavings, ply trim, sawdust, chips, sunflower seed hulls, walnut shells, culls, trimmed materials, print overruns, over-issue publications and obsolete inventories. (Previously referred to as Post-industrial Content).

Rainwater Harvesting
The practice of collecting, storing and using precipitation from a catchment area such as a roof.

Rapidly Renewable Materials
Material considered to be an agricultural product, both fiber and animal, that takes 10 years or less to grow or raise, and to harvest in an ongoing and sustainable fashion.

Renewable Energy
Alternative energy derived from sources that do not use up natural resources or harm the environment. Examples are solar, hydroelectric or wind energy.

Renewable Energy Certificates (RECs)
RECs are a representation of the environmental attributes of green power and are sold separately from the electrons that make up the electricity. RECs allow the purchase of green power even when the electrons are not purchased.

Salvaged Materials
Construction materials recovered from existing buildings or construction sites and reused in other buildings. Common salvaged materials include structural beams and posts, flooring, doors, cabinetry, brick and decorative items.

Sick Building Syndrome (SBS)
Building whose occupants experience acute health and/or comfort effects that appear to be linked to time spent therein, but where no specific illness or cause can be identified. Complaints may be localized in a particular room or zone, or may spread throughout the building. (EPA)

Stormwater Runoff
Water volumes that are created during precipitation events and that flow over surfaces into sewer systems or receiving waters, including rivers and streams. All precipitation waters that leave project site boundaries on the surface are considered to be stormwater runoff volumes.

GLOSSARY

Sustainable
A resource or system that meets present needs without compromising those of future generations.

Sustainable Yield vs. Ecologically Sustainable Forestry
Sustainable yield forestry dictates that the same numbers of trees cut down are planted.

Thermal Comfort
The appropriate combination of temperature combined with airflow and humidity which allows one to be comfortable within the confines of a building.

U.S. Green Building Council (USGBC)
The nation's foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work.

Volatile
Any substance that evaporates readily. (EPA)

Volatile Organic Compound (VOC)
Carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vaporize (become a gas) at normal room temperatures.

Wastewater
The spent or used water from a home, community, farm or industry that contains dissolved or suspended matter. (EPA)

Wetland Vegetation
Plants that require saturated soils to survive as well as certain tree and other plant species that can tolerate prolonged wet soil conditions.

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ADDITIONAL INFORMATION

CONTACT INFORMATION

For all USGBC customer service inquiries, please call (US) 1-800-795-1747 or (outside US) 202-742-3792.

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ADDITIONAL INFORMATION

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USGBC is your source for LEED and green building knowledge. With the most innovative and highest-quality trainings, a USGBC education can help build your career. Earn credential maintenance for most offerings.

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- from others in an engaging, supportive learning environment
- using real-world examples, scenarios, and case studies

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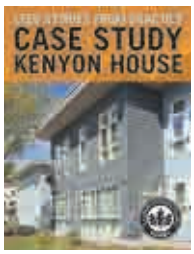
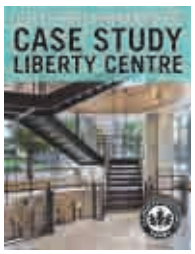
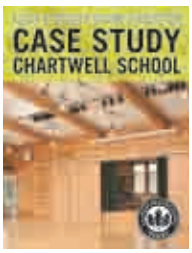
LEED Project Case Studies: Stories from Practice: *www.usgbc.org/casestudies*

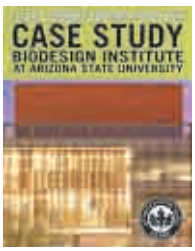
Learn from real project teams through:

- lessons learned and best practices
- case study e-books or short articles









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  Take advantage of USGBC's LEED Study Guides and Chapter study groups, and be sure to study all references listed in GBCI's Candidate Handbook.
- Maintain your LEED credentials? *www.usgbc.org/credential*s
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ADDITIONAL INFORMATION

PUBLICATIONS

LEED Reference Guides: *www.usgbc.org/publications*

Whether working on a green building project, preparing for a LEED credentialing exam, or looking to expand your green building knowledge, these guides are essential resources. Based on the LEED rating systems, they provide the most thorough and comprehensive information available.

LEED Exam Prep Resources: *www.usgbc.org/publications*

USGBC's LEED exam study guides and other exam resources help you succeed in earning a LEED credential. They offer a variety of study tools, including review and practice questions. Choose from the following:

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- LEED AP with Specialty Study Guides for every credential: BD+C, ID+C, O+M, Homes, ND
- LEARN LEED: How-to Guide for Planning and Conducting LEED Study Groups

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These practical guides help green building professionals integrate LEED into their business practices by providing background, case examples, checklists, and tools.

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USGBC is a community of member companies and organizations of all sizes, in every sector of the industry. They and their employees drive everything we do as we work toward green buildings for everyone within a generation. Membership puts you in the driver's seat of the green building movement, saves you money, and gives you exclusive access to the latest information, news and opportunities.

USGBC's Mission

To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life.

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APPENDIX 2: LEED 201 – CORE CONCEPTS & STRATEGIES

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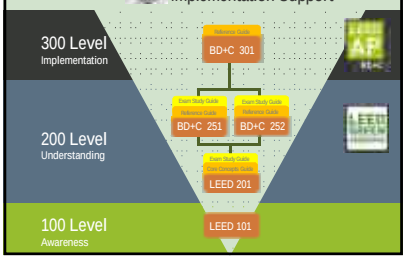
Learning Objectives

- Describe the structure of the LEED rating system and the overall LEED certification process
- Describe key green building concepts and goals associated with LEED
- Recognize successful LEED strategies and measurements for achieving goals
- Describe the central role of integrative design
- Identify and explain synergies between LEED credit categories and strategies
- Describe case studies that represent LEED best practices in action across the range of building markets

Agenda

Introduction + Activity 1
Sustainable Sites
Break
Water Efficiency + Activity 2
Energy & Atmosphere
Lunch
Materials & Resources
Indoor Environmental Quality + Activity 3
Break
Innovation in Design
Summary + Activity 4

LEED Credential & Implementation Support



LEED Green Associate

Credential Information

www.gbci.org

Triple Bottom Line

Buildings Account for…

72% of electricity consumption

39% of energy use

38% of all carbon dioxide emissions

14% of potable water consumption

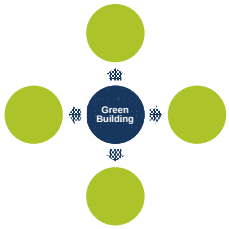
40% of raw materials use

30% of waste output

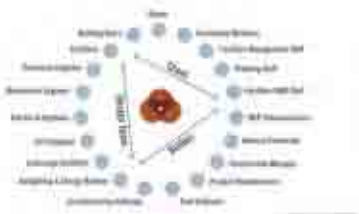
Green Building Addresses…

- Climate change
- Resource depletion
- Water consumption
- Degradation of ecosystems/habitat
- Indoor environmental quality
- Occupant comfort and productivity
- Costs of owning and operating work and living spaces

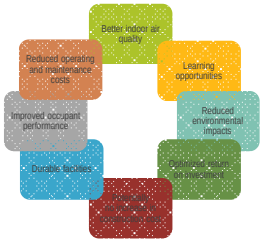
Group Activity 1: A Green Building Mind Map



Integrative Approach: Key Stakeholders



Integrative Approach: Benefits



USGBC's Mission

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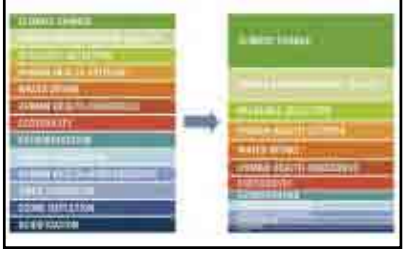
Environmental Impacts



LEED Addresses…

GREEN BUILDING DESIGN & CONSTRUCTION	LEED FOR NEW CONSTRUCTION
	LEED FOR CORE & SHELL
	LEED FOR SCHOOLS
	LEED FOR HEALTHCARE
	LEED FOR RETAIL
GREEN INTERIOR DESIGN & CONSTRUCTION	LEED FOR COMMERCIAL INTERIORS
	LEED FOR RETAIL INTERIORS
GREEN BUILDING OPERATIONS & MAINTENANCE	LEED FOR EXISTING BUILDINGS: OPERATIONS AND MAINTENANCE
GREEN HOMES DESIGN & CONSTRUCTION	LEED FOR HOMES
GREEN NEIGHBORHOOD DEVELOPMENT	LEED FOR NEIGHBORHOOD DEVELOPMENT

Minimum Program Requirements

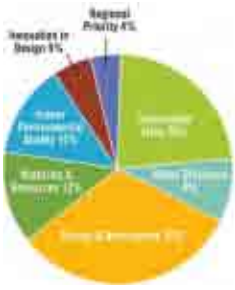
- Comply with environmental laws
- Be a complete, permanent building or space
- Use a reasonable site boundary
- Comply with minimum floor area requirements
- Comply with minimum occupancy rates
- Commit to sharing whole-building energy and water usage data
- Comply with a minimum building area to site area ratio

Organization of LEED

LEED Rating System Structure

Point Distributions

LEED for New Construction and Major Renovations



Regional Priority Credits

Certification Levels

40-49 50-59 60-79 80+

Points

Certification Process: Commercial

Certification Process: Homes

Certification Tools

- Rating systems
- Reference guides
- LEED Online
- *www.usgbc.org*
- *www.gbci.org*
- Case studies
- Multi-Building and Volume

Certification Tool: LEED Project Checklist

Certification Tool: LEED Online

Certification Tool: LEED Credit Forms

LEED Credit Category Synergies

Let's Review

What constitutes the largest use of energy in buildings in the United States?

A. Space cooling
B. Space heating
C. Electric lighting
D. Water heating

Let's Review

Green building emphasizes using what type of design process?

A. Linear
B. Multistage
C. Integrative
D. Tiered

Sustainable Sites

LEED Core Concepts & Strategies

THINK ABOUT IT

Sustainable Sites

Sustainable Sites Intents

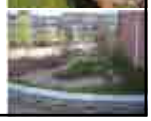
- Reduce transportation demand
- Minimize stormwater impact
- Protect natural habitat
- Reuse/restore sites

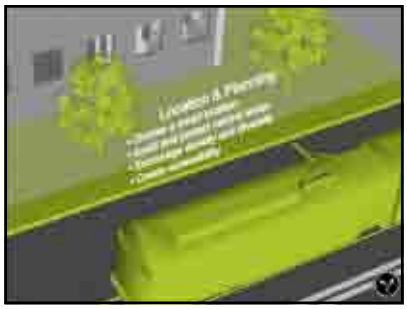
The Integrative Approach

Design

Construction

Operations





Strategies to Choose a Smart Location

- Locate near services
- Locate near transportation
- Ensure access to infrastructure

Example: Locate Near Transportation

- Provide access to multiple transportation modes
- Encourage car sharing or van pools
- Plan for bicycle accessibility

LEED Credits Related to Choosing a Smart Location

LEED RATING SYSTEMS						
NC	Schools	CS	CI	EB: O&M	Homes	ND
SSc1 Site Selection				SSc1 LEED Certified Design & Construction	LLc1 LEED-ND LLc2 Site Selection LLc3 Preferred Locations	SLLp1 Smart Locations SLLc1 Preferred Locations

Strategies to Protect Natural Areas

- Avoid impacts on sensitive habitat
- Protect buffers
- Avoid floodplains
- Avoid steep slopes

Strategies to Encourage Density & Diversity

- Create compact development
- Provide proximity to diverse services
- Provide a diversity of housing types

Example: Mixed-Use Infill Projects

Photo by Karen Hansen

Strategies to Create Accessibility

- Ensure walkability
- Design dense street grids
- Provide access to recreational spaces

Project Example: Location & Planning

Prince Abdulaziz bin Mousaed Economic City Ha'il, Saudi Arabia

Strategies to Select Previously Developed Sites

Richmond, Virginia

Strategies to Preserve Habitats & Wetlands

- Use native and adapted plantings
- Protect the majority of the site
- Limit site disturbance

Example: Erosion & Sediment Control

Photo by Kalpana Kulbaah

Strategies to Protect Surface Waters & Ecosystems

- Manage stormwater
- Use Best Management Practices (BMPs)
- Reduce runoff

Texas Advanced Computing Building
Photo by Kalpana Kulbaah

Example: Best Management Practice

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Example: Outdoor Filtration System

Sidwell Friends Middle School
Photo by Hillary Platt

Metrics: Stormwater Management

- Precipitation volume metric:
  Percentage of storm event retained on-site
- Water quality metric:
  Percentage removal of nutrients and suspended solids

Strategies to Reduce Heat Island Effect

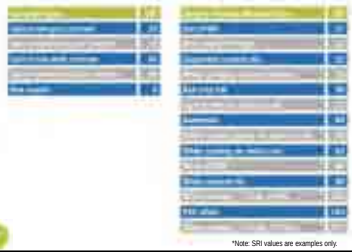
- Reduce heating from rooftops
- Reduce heating from hardscapes

Chicago Center for Green Technology
Photo ©2005 Farr Associates Architecture Planning, Preservation, Chicago, IL

Example: Reflective Paving Surfaces

Photo by Marc Lamkin

Metric: Solar Reflectance Index (SRI)



*Note: SRI values are examples only.

LEED Credits Related to Reduce Heat Islands

LEED RATING SYSTEMS						
NC	Schools	CS	EB: O&M	CI	Homes	ND
SSc7.1 Heat Island Effect – Non-roof SSc7.2 Heat Island Effect – Roof				SSc1 Option 2 Path 4 - Non-roof Path 5 – Roof	SSc3 Local Heat Island Effects	GIBc9 Heat Island Reduction

Strategies to Reduce Light Pollution

City of Seattle Justice Center
Photo © Christian Richters

- Reduce escape of interior lighting
- Control exterior lighting

Strategies to Protect Human Health

- Use green cleaning for exteriors
- Avoid toxic paints and sealants
- Institute integrated pest management

Strategies to Reduce Maintenance Impacts

- Low-impact maintenance

Project Example: Site Design & Management

Civic Space System Capital District, Abu Dhabi

Sustainable Sites Synergies

- Site design helps orient buildings to maximize energy efficiency.
- Reflective surfaces and shading reduce energy use.

Photo by The Kubala Washatko Architects, Inc/Mark W. Herron

Photo by Joseph St. Pierre

Reference Standard for Sustainable Sites

- ASHRAE/IESNA 90.1 Exterior Lighting

Photo courtesy of AJC Architects

Sustainable Sites: Incentives

Financial Incentives

Federal, state, and local government programs:

- Encourage reuse of infill and "brownfield" sites
- Promote water quality protection through combinations of Smart Growth and low-impact development

LET'S REVIEW

A project that specifies exterior surfaces with high solar reflectance index (SRI) values is contributing to which environmental benefit?

A. Reduced heat island effect
B. Support for renewable energy
C. Protection of the dark-sky initiative
D. Improved stormwater quality

LET'S REVIEW

Decreasing impervious surfaces on a project site will _____?

A. Decrease percolation rates
B. Reduce potable water usage
C. Reduce stormwater runoff
D. Eliminate sewage piping

SUMMARY

Sustainable Sites

Dockside Green Phase I – Synergy
Photo by Enrico Dagostini, Vince Klassen

Water Efficiency

LEED Core Concepts & Strategies

THINK ABOUT IT

Water Efficiency

Water Efficiency Intents

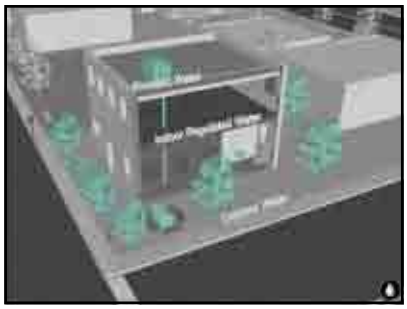
- Dramatically reduce water use
- Use the right water for the right purpose

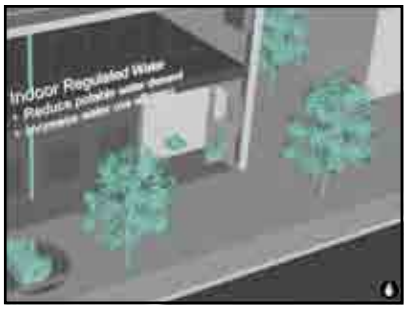
The Integrative Approach

Design

Construction

Operations





Strategies to Reduce Potable Water Demand (Indoor)

Photo by Giuseppe Salitta/Mitch York

- Use non-potable water
- Reduce water use (innovative wastewater treatment)

Example: Greywater / Captured Rainwater

Photo by Adrian Velicescu of Standard Photography

Example: Blackwater

Photo by Chris Schaffner

Strategies to Increase Water Use Efficiency

Use high-efficiency or waterless fixtures

Photos courtesy CCI Center

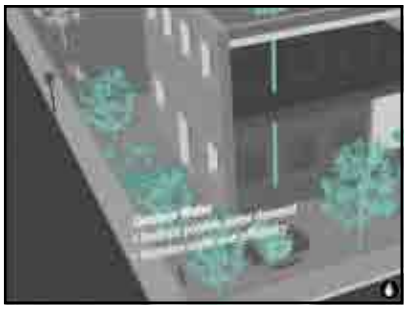
Metric: Maximum Flow Rate

Project Example: Indoor Water Efficiency

Water Strategy C113 Master Plan, Chennai

LEED Credits Related to Reduce Potable Water Demand

LEED RATING SYSTEMS						
NC	Schools	CS	CI	Homes	EB: O&M	ND
WEp1 Water Use Reduction WEc3 Water Use Reduction			WEc1 Water Use Reduction	WEc3 Indoor Water Use	WEp1 Minimum Indoor Plumbing Fixture and Efficiency WEC1 WEc4 Cooling Tower Water Management	GIBp3 Minimum Building Water Efficiency GIBc3 Building Water Efficiency



Strategies to Reduce Potable Water Demand (Outdoor)

- Use drought-tolerant, adaptive and/or native plants
- Capture rainwater or greywater for irrigation

City Of Los Angeles Fire Station 36
Photo by James Simmons

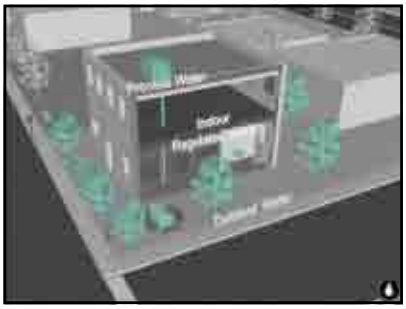
Strategies to Increase Water Use Efficiency

Photo by Jennifer L. Owens

- Use high-efficiency irrigation technologies
- Monitor water use

Project Example: Outdoor Water Efficiency

Open Space System Diplomatic Quarter, Riyadh



Strategies to Reduce Potable Water Demand (Process Water)

Substitute non-potable water

Strategies to Increase Process Water Use Efficiency

- Sub-meter cooling towers
- Improve cooling tower chemical management

Project Example: Process Water Efficiency

Fixture Selection

Water Efficiency Synergies

- Water conservation saves electricity and reduces greenhouse gas emissions.
- Water efficiency and site design are closely linked – native/adaptive plantings reduce water demand.

Reference Standards for Water Efficiency

- Energy Policy Act of 2005
- 2006 Uniform Plumbing Code
- 2006 International Plumbing Code

Incentives, Recognition & Regulations for Water Efficiency

Financial Incentives
State and local credits and rebates for water saving devices

Recognition programs
EPA's WaterSense product label

Goals and requirements
Federal mandate: Federal facilities reduce water use intensity by 2% per year for 2006 through 2015

EPA mandate: Use of water conserving plumbing fixtures in residential, commercial and industrial buildings

Let's Review

What is reduced when a project uses reclaimed water in its cooling towers?

A. Potable water use
B. Process water use
C. Indoor plumbing water use
D. Nonpotable water use
E. Irrigation water use

Let's Review

Nonpotable water is typically suitable for which of the following uses (select two)?

A. Ice making
B. Drinking
C. Showers
D. Toilet Flushing
E. Irrigation

SUMMARY

Water Efficiency

Group Activity 2: Case Study Analysis

King Street Center

Location: Seattle, WA
LEED Rating System:
LEED for Existing Buildings
LEED Certification Level: Gold

The Solaire

Location: New York, NY
LEED Rating System:
LEED for New Construction
LEED Certification Level: Gold

Case Study A: The Solaire

Photos courtesy of HLD/ Blankman Public Relations Agency

Case Study B: King Street Center

Photos courtesy of King County Solid Waste Division

Energy & Atmosphere

LEED Core Concepts & Strategies

Klaus Advanced Computing Building
Photo by Kalpana Kuttasai

THINK ABOUT IT

Energy & Atmosphere

Energy & Atmosphere Intents

- Reduce energy use
- Increase energy efficiency
- Meet energy needs with clean, renewable energy supplies

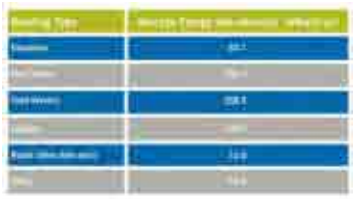
The Integrative Approach

Design

Construction

Operations

Metric: Typical Energy Use



Source: U.S. Energy Information Administration

Creekside Village Community Center
Photo by K.C. Kratt

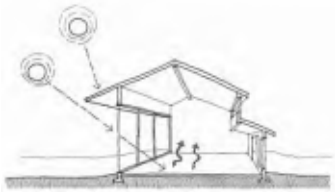
Strategies to Reduce Energy Demand

- Shading
- Site design and orientation
- Building design and mass
- Daylighting
- Natural ventilation
- Reduced building size

LEED Credits Related to Reduce Energy Demand

LEED RATING SYSTEMS						
NC	Schools	CS	CI	Homes	EB: O&M	ND
EAp2 Minimum Energy Performance EAc1 Optimize Energy Performance				EAp1.1; c1 Optimize Energy Performance	EAp2 Minimum Energy Efficiency Performance EAc1 Optimize Energy Efficiency Performance	GIBp2 Minimum Building Energy Efficiency GIBc2 Building Energy Efficiency

Example: Building Orientation



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Example: Natural Ventilation

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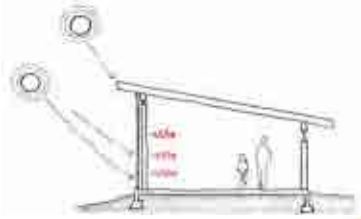
Example: Passive Cooling

Aldo Leopold Center
Photo by Mick Shaw at Bright Construction

Example: Passive Solar



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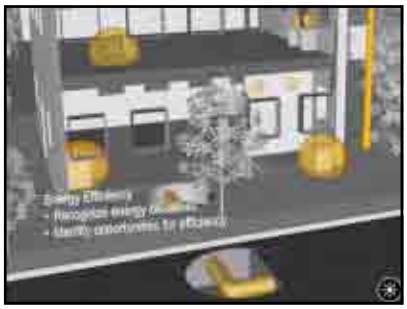
Project Example: Energy Demand

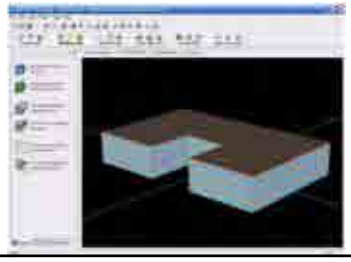
Capital District Business Centre
Abu Dhabi



Strategies to Recognize Energy Baselines

- Apply whole building energy simulations
- Establish reference baselines

Example: Whole Building Energy Simulations



Strategies to Identify Opportunities for Energy Efficiency

Use energy-efficient:

- Water heating
- Computers and appliances
- Equipment
- Lighting
- Building envelope

Example: Building Envelope

Example: Solar Thermal Water Heating Systems

Example: High-Performance T5 Lamps

Refrigerants

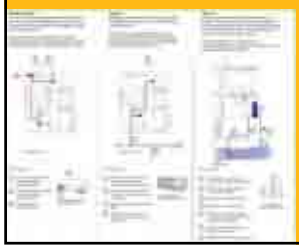
CFC = Chlorofluorocarbon

HCFC = Hydrochlorofluorocarbon

ODP = Ozone-depleting potential

GWP = Global warming potential

Project Example: Energy Efficiency



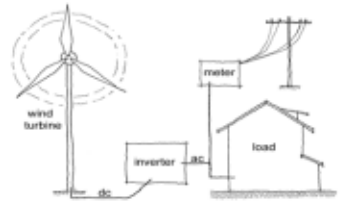
Building Development Guidelines, C113 Master Plan, Chennai

Strategies for Generating On-Site Renewable Energy

EPA National Computer Center
Photo by Bill Touchberry Photography

- Solar photovoltaics
- Wind power
- Geothermal
- Biomass
- Fuel cells

Example: Harvest Site Energy



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Strategies: Purchase Off-Site Renewable Energy

- Purchase green power
- Purchase renewable energy certificates (RECs)

LEED Credits Related to Purchase Offsite Renewable Energy

LEED RATING SYSTEMS						
NC	Schools	CS	EB	CI	Homes	ND
EAc6 Green Power			EAc4 On-site and Off-site Renewable Energy	EAc4 Green Power	EAc10 Renewable Energy	N/A

Project Example: Energy Supply

Building Integrated Photovoltaic Panels, Masdar Institute, Abu Dhabi

Strategies to Measure Energy Performance

- Commissioning
- Monitoring and verification
- Benchmarking (ENERGYSTAR, Home Energy Ratings)

Project Example: Energy Performance

Commissioning, Herman Miller, New York City

Energy & Atmosphere Synergies

- Building design can reduce energy demand.
- Site design can reduce energy demand.

Energy & Atmosphere: Incentives

Public Sector

- Expedited review and permitting
- Development incentives
- Tax credits
- Tax rebates
- Technology-based

Private Sector

- Financing availability
- Corporate social responsibility
- Lower risk potential
- Lower property insurance premiums

LET'S REVIEW

To what do renewable energy certificates (RECs) refer?

A. On-site photovoltaic systems
B. Off-site renewable energy purchases
C. Market-generated wind power
D. Stock in utility companies

LET'S REVIEW

One of the most cost-effective ways to ensure optimal ongoing energy performance is to _____?

A. Install renewable energy systems
B. Upgrade mechanical systems
C. Commission building systems
D. Maintain trees and landscaping features

SUMMARY

Energy & Atmosphere

Materials & Resources

LEED Core Concepts & Strategies

THINK ABOUT IT

Materials & Re

Materials & Resources Intents

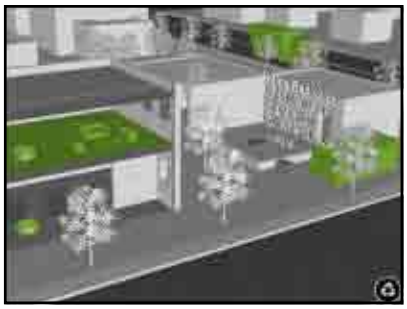
- Reduce the amount of materials needed
- Use materials with less environmental impact
- Reduce and manage waste

The Integrative Approach

Design

Construction

Operations



Strategies to Reduce Waste Generation

- Establish/expand recycling programs
- Perform waste audits
- Practice sustainable purchasing

Strategies to Divert & Reuse Waste

- Construction demolition waste
- Solid waste recycling

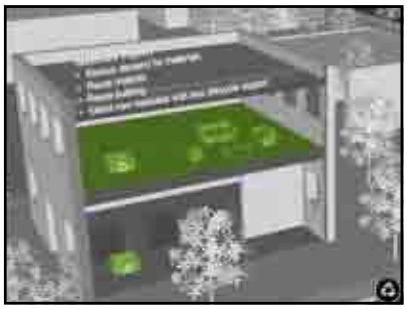
Merchandise Mart
Photo by Dawn Holtrop

Kanges-Faulconbridge Office Building
Photo by W. Jim Carter/Green Scale

Example: Factory Prefabrication / Advanced Framing

Project Example: Reducing Waste

Herman Miller, New York City



Strategies to Reduce Demand for Materials

- Design strategies
- Construction strategies
- New technology solutions

Examples of Materials Reuse

- Use reclaimed, salvaged, and refurbished materials
- Purchase reclaimed or salvaged materials

LEED Credits Related to Material Reuse

LEED RATING SYSTEMS						
NC	Schools	CS	EB: O&M	CI	Homes	ND
MRc3 Materials Reuse			N/A	MRc3.1 Materials Reuse MRc3.2 Materials Reuse – Furniture and Furnishings	N/A	N/A

Example of Building Reuse

Reuse existing buildings or portions of existing buildings

Examples of Rapidly Renewable Materials

- Bamboo, cork, linoleum or wool flooring
- Cotton batt insulation
- Sunflower seed board panels
- Wheatboard cabinetry

Examples of Materials with Less Lifecycle Impact

- Recycled content (post- and pre-consumer)
- Locally-sourced
- Rapidly renewable
- Certified wood

Project Example: Environmental Impact of Materials

Herman Miller, Atlanta

Materials & Resources Synergies

- Recycled building materials reduce landfill-related emissions.
- Sustainable purchasing programs improve indoor air quality.
- Non-toxic materials have environmental benefits.

Materials & Resources: Recognition & Regulations

Recognition: A variety of product certifications are available, such as Green Seal and Cradle to Cradle

Regulations: Rare; some organizations have internal policies for materials and supply chain management

LET'S REVIEW

How many years can an agricultural product grow or be raised to be considered as rapidly renewable by LEED?

A. 5
B. 10
C. 15
D. 20

LET'S REVIEW

LEED defines regional materials as originating within_____ miles of the project site?

A. 50
B. 250
C. 500
D. 750

SUMMARY

Materials & Res

Indoor Environmental Quality

LEED Core Concepts & Strategies

THINK ABOUT IT

Indoor Environmental Quality

Indoor Environmental Quality Intents

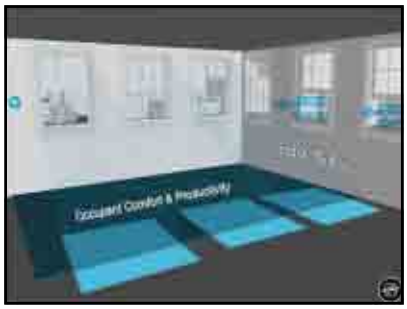
- Provide systems to ensure a quality indoor environment
- Eliminate, reduce and manage contaminants

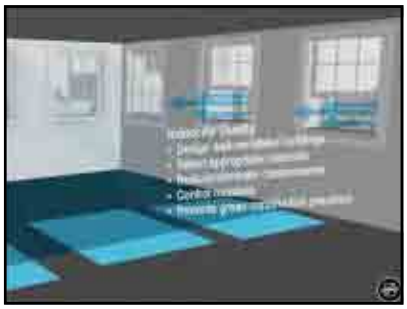
The Integrative Approach

Design

Construction

Operations





Strategies to Design Well-Ventilated Buildings

- Provide sufficient fresh air
- Exchange air regularly

Siemens II Building
Photo by Anthony Simons

LEED Credits Related to Design Well-Ventilated Buildings

LEED RATING SYSTEMS						
NC	Schools	CS	CI	EB: O&M	Homes	ND
IEQp1 Minimum Indoor Air Quality Performance IEQc1 Outdoor Air Delivery Monitoring IEQc2 Increased Ventilation				IEQc1.2 Outdoor Air Delivery Monitoring IEQc1.3 Increased Ventilation	EQc4 Outdoor Air Ventilation	N/A

Examples of Appropriate Materials

Low-emitting materials

Hill Gunlocke Corporate Headquarters
Photo by Dale Photographic

Strategies to Reduce/Eliminate Contaminants

- Radon mitigation
- Cleaning products
- Tobacco smoke
- Entryway systems
- Construction air quality management plan

Strategies to Reduce Moisture

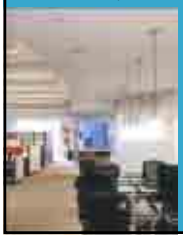
- Cover materials during construction
- Direct rainwater away from building
- Maintain building envelope
- Control humidity

Strategies to Promote Green Construction Practices

Photo by Dan Johnson

Project Example: Indoor Air Quality

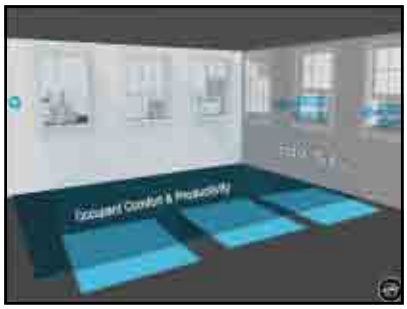
Herman Miller, New York City

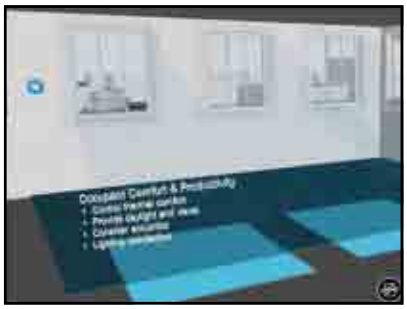


zero or low VOC paints & adhesives

increased fresh air

low-emitting materials

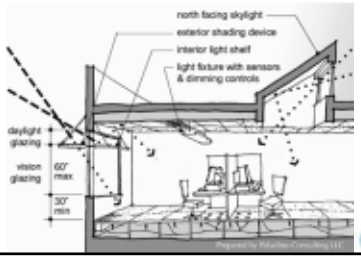




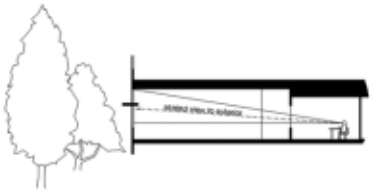
Strategies to Control Thermal Comfort

- User control
- Monitor performance
- ASHRAE standards

Strategies to Provide Daylight & Views



Metric: Horizontal View to Confirm View Access



Strategies to Consider Acoustics

- Acoustics impact
- Reduce interior noise transmission

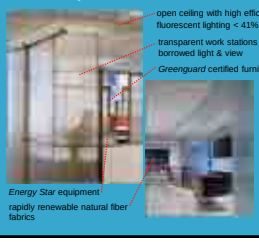
LEED Credits Related to Consider Acoustics

LEED RATING SYSTEMS						
Schools	NC	CS	EB: O&M	CI	Homes	ND
IEQp3 Minimum Acoustical Performance IEQc9 Enhanced Acoustical Performance	N/A					

Strategies to Provide Lighting Satisfaction

Occupant lighting control

Project Example: Occupant Comfort & Productivity



Indoor Environmental Quality: Regulations

Guidance for indoor environmental quality is available from public and private sector organizations, including:

- Department of Labor
- EPA
- ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers)

LET'S REVIEW

The abbreviation "VOC" refers to _____?

A. Variable operating conditions
B. Volatile organic compounds
C. Variable ozone contaminants
D. Versatile organized compounds

LET'S REVIEW

Thermal comfort is typically attributed to what environmental factors?

A. Temperature, humidity, and air speed
B. Ventilation, temperature, and daylight
C. Humidity, ventilation, and controllabilty
D. Density, temperature, and solar heat gain

SUMMARY

Indoor Environmental Quality

Group Activity 3: Designing a New Green School

Scenario:
You are a member of an integrated design team working on the new construction of an elementary school.

Instructions:
Review detailed instructions and scenario background information in your workbook to brainstorm appropriate strategies for the school.

Innovation in Design

LEED Core Concepts & Strategies

THINK ABOUT IT

Innovation in D

Innovation in Design Intents

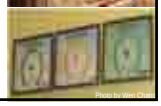
- Explore exceptional and innovative approaches
- Pursue strategies beyond LEED's existing credits or prerequisites

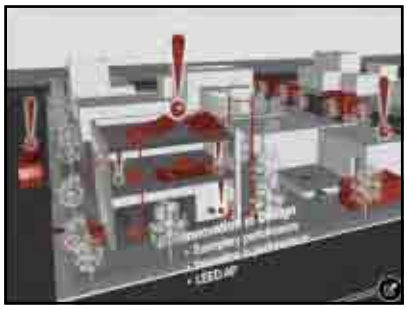
The Integrative Approach

Design

Construction

Operations





PROJECT EXAMPLES:

Innovation in Design

Case Example: Charlottesville Transit Center

Case Example: CCI Center

Case Example: Interface Showroom & Offices

Case Example: Goldman Sachs Tower

LET'S REVIEW

An Innovation in Design credit for exemplary performance would be available for_____?

A. Implementing a comprehensive green building education program
B. Significantly diverting construction waste beyond the requirement of 75%
C. Providing 75% more spaces with daylighting
D. Developing a green housekeeping policy

SUMMARY

Innovation in I

Group Activity 4: Gaia Hotel

Location: Canyon Valley, CA

LEED Rating System: LEED for New Construction

LEED Rating System: Gold

Summary Case: Gaia Hotel

Photos by Bruce Schneider

Summary Case: Gaia Hotel

Photo by Wen Chang

Synergies & Integrative Design

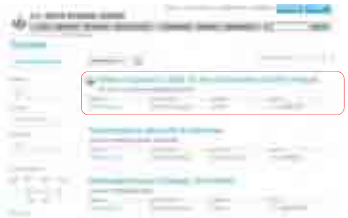
Action Items

Additional Resources

More Information

www.usgbc.org/LEED

Course Catalog – *New!*



Thank You!

Watch your email for a Zoomerang workshop evaluation.
You will receive a link to additional resources when you complete the survey.

APPENDIX 3: ATTENDEES LEED 201- CORE CONCEPTS & STRATEGIES

LEED 200-Core Concepts and Strategies
18th May 2011

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LEED 200-Core Concepts and Strategies
18th May 2011

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23.					
24.					
25.					
26.					

Supported by:

ADDITIONAL ATTENDEES

- Lina Khori
- Jonathan Morse

APPENDIX 4: PARTICIPANT WORKBOOK-LEED ID+C 301

PARTICIPANT WORKBOOK

ID+C 301: IMPLEMENTING THE INTERIOR DESIGN + CONSTRUCTION LEED RATING SYSTEM

U.S. GREEN BUILDING COUNCIL
USGBC®

THANK YOU FOR HELPING US SUPPORT OUR MISSION

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LUNCH

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BREAK

- PHASE 5: CONTRACT ADMINISTRATION
- PHASE 6: CLOSE-OUT/POST-OCCUPANCY
- SUMMARY

CASE STUDY

TENANT 1:	Multi-national Aluminum Company, Government Affairs Division
TENANT 2:	Furniture Manufacturing Company, Regional Showroom
TENANT 3:	Real Estate Services Company

TENANT 1:
MULTI-NATIONAL ALUMINUM COMPANY, GOVERNMENT AFFAIRS DIVISION

Client Goals

A multi-national aluminum company is seeking to consolidate its Government Affairs division within a major metropolitan area. It desires an appropriate image that projects a high level of prestige and credibility, and supports meetings with high-level visitors.

It seeks LEED certification at a minimum Gold level.

Program

- On one level, there are 19,500 usable square feet (SF) for 40 full-time equivalents (FTEs).
- A high level of privacy is required.
- About 70% of the area is closed space, including large offices, a large conference center with pre-function area, hotelling spaces, and a café. The remainder of the program is open office area.

Location

A central business district or nearby sub-districts are desired.

Infrastructure

- State-of-the-art mechanical, electrical, and plumbing (MEP) systems; after-hours HVAC required.
- Fifteen parking spaces.

Additional Information

- There is a reasonable, somewhat flexible 16-month project schedule from site selection to move-in.
- The company operates in a number of overseas locations and seeks to bolster its environmental credentials, including a commitment to reducing its CO_2 footprint through a focus on wood products, including but not limited to sustainably harvested, rapidly renewable, and low-emitting composite woods.

CASE STUDY

TENANT 1:	Multi-national Aluminum Company, Government Affairs Division
TENANT 2:	Furniture Manufacturing Company, Regional Showroom
TENANT 3:	Real Estate Services Company

TENANT 2:
FURNITURE MANUFACTURING COMPANY, REGIONAL SHOWROOM

Client Goals

A dynamic, design-oriented office furniture company needs to expand and relocate its regional showroom and support staff. It desires a flexible, collaborative space with which to fashion a unique design statement. This showroom is the primary place where the company interacts with its customers. The showroom is used frequently for company-sponsored and community events.

The fit-out will seek LEED certification at a minimum Silver level.

Program

- There are 15,000 usable square feet (SF) for 14 full-time equivalents (FTEs); one floor plate with high ceilings.
- About 80% open, flexible space is required for a display area, café, and support staff. The remainder of the program is conference and presentation rooms, support spaces, and one private office.

Location

The company is flexible on a possible location, but it must have good transportation access for customers regardless of the method.

Infrastructure

- After-hours HVAC required.
- Parking spaces (40).

Additional Information

- It is a moderate length, 12-month project schedule, from site selection to move-in.
- Material selection should play a role in communicating the company's design and environmental objectives, with a focus on reused products.
- A high degree of lighting control throughout the showroom areas is needed to support a variety of situations and events.
- The company requires individual lighting control for staff.

CASE STUDY

TENANT 1: Multi-national Aluminum Company, Government Affairs Division

TENANT 2: Furniture Manufacturing Company, Regional Showroom

TENANT 3: Real Estate Services Company

TENANT 3:
REAL ESTATE SERVICES COMPANY

Client Goals

A regional real estate services company is downsizing in a major metropolitan region because of current market conditions. It is consolidating separate service groups — landlord and tenant brokerage, facilities management, investment, and development — into a single location that represents the company's brand identity. This identity is focused on a high level of personal service for its regional and hometown customers.

It seeks LEED certification at a minimum Gold level.

Program

- There are 20,000 usable square feet (SF) for 90 full-time equivalents (FTEs) on one level.
- A combination of private offices and open office space is required, with the percentage mix to be determined.
- Reception, presentation, and conference rooms, as well as a break room/café are included in the requirements.

Location

A business district with excellent transportation access – car or transit – is desired.

Infrastructure

- Requires typical MEP systems and after-hours HVAC.
- Needs 25 parking spaces.
- Desires high-quality indoor air quality.

Additional Information

- Due to an early public commitment to LEED Gold, this achievement level is critical.
- Schedule is a fast-paced eight months from site selection to construction.
- Firm's business strategy is focused on its region where it supports a variety of local initiatives, including a focus on regionally-sourced materials.
- About 35% of FTEs is out of the office for half of a typical work week.

ACTIVITY 1

Directions
Worksheet
Content

EVALUATE & SELECT SITE/BUILDING USING LEED FOR COMMERCIAL INTERIORS

Objectives

The objective of this activity is to evaluate site/building options using an abbreviated LEED checklist and client's requirements. After completing the activity, you will recognize how site/building selection supports LEED for Commercial Interiors.

Directions

You are the LEED champion on a commercial interior real estate team. The team is in the process of selecting a site/building. You need to evaluate and select the best property to accomplish the client's goals, including LEED certification as described in its site selection criteria. Your group will continue with your selected site in several course exercises:

1. If you have not already done so, take a few minutes for brief introductions among your group members.
2. Individually, take five minutes to review the activity worksheet, property options, and the background information on your assigned tenant, including its site selection criteria. (This is found at the beginning of the Activity section. You may wish to tear your tenant case study from the workbook for reference throughout the day.) A complete LEED checklist is included at the back of your workbook for reference.
3. As a group, take 10 minutes to discuss the project, considering the following:
    A. How did you prioritize the site selection process?
    B. Which credits are impacted by site selection but cannot be achieved completely at this point?
    C. What improvements would you ask from the landlord?
    D. What additional information would you find useful to evaluate your selected site?
    E. Is there an ideal site from a LEED point of view?
4. On the worksheet provided, rank the site/building options, choosing the best. Be prepared to explain your selection based on the client's goals and site characteristics.
5. Your instructor(s) will stop you after 20 minutes to initiate a discussion.

All groups will be selecting from the same sites, but with different client goals, so be prepared for one group member to describe briefly the client's goals to the rest of the class. All site options are assumed to fit within the budget of each tenant.

ACTIVITY 1

Directions
Worksheet
Content

EVALUATE & SELECT SITE/BUILDING USING LEED FOR COMMERCIAL INTERIORS

Worksheet

Directions	Rank the following sites from 1-5, with 1 being the best/preferred site. Be prepared to explain your ranking based on the client's goals and the site's characteristics. Record your notes below.
Site A _____	Notes:
Site B _____	Notes:
Site C _____	Notes:
Site D _____	Notes:
Site E _____	Notes:

ACTIVITY 1

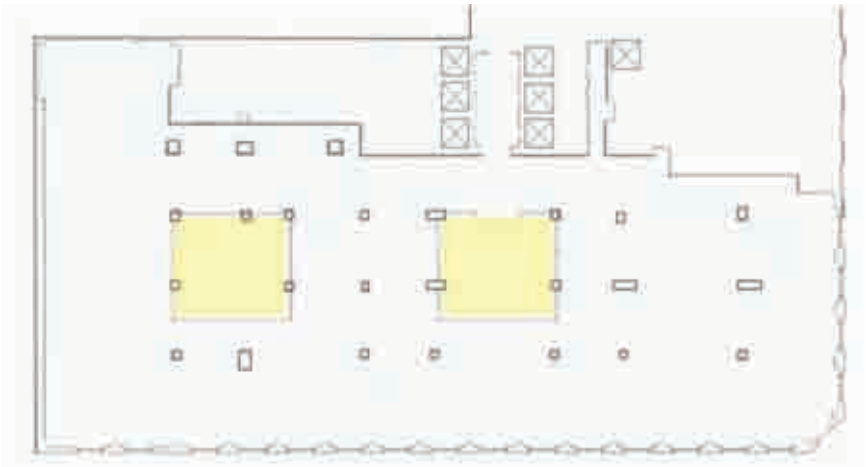
Directions
Worksheet
Content

EVALUATE & SELECT SITE/BUILDING USING LEED FOR COMMERCIAL INTERIORS

Site A: Adams Square

Site Aerial

Exterior



Upper Floor Plate

ACTIVITY 1

Directions
Worksheet
Content

Site A: Adams Square (continued)

	Site Description
Surroundings	▸ High-density area with 12-story office, hotel, and residential buildings; located in core of central business district; numerous neighborhood services; high pedestrian traffic area
Transportation Access	▸ Located within one-quarter mile of one rail station served by three subway lines and four bus routes
	Base Building Description
Image	▸ Completely renovated and upgraded 1920s landmark building with two internal atria with skylights ▸ Limestone exterior, with upgraded windows – landlord will allow tenant to make windows operable at tenant expense
Floor Plate	▸ About 25,000 usable SF, existing built-out with a high-quality tenant HVAC system easily re-configurable for a new tenant ▸ Large punched windows with 2' 6" sills and 8' 9" heads ▸ Column spans of 20 and 30 feet; concrete structure; 10-foot finished ceilings possible
Amenities & Services	▸ On-site fitness club available to tenants ▸ Underground car park of 150 spaces ▸ Recycling program ▸ Paved roof terrace and meeting room
Infrastructure	▸ Modern rooftop central plant HVAC system with high-efficiency MERV 14 filtration and humidification

ACTIVITY 1

Directions
Worksheet
Content

EVALUATE & SELECT SITE/BUILDING USING LEED FOR COMMERCIAL INTERIORS

Site B: Crystal Tower

Site Aerial

Exterior

Upper Floor Plate

ACTIVITY 1

Directions
Worksheet
Content

Site B: Crystal Tower (continued)

	Site Description
Surroundings	▶ Medium density with 8- to 12-story office buildings; located in an emerging business neighborhood built on a former brownfield
Transportation Access	▶ Located within one-quarter mile of one bus route and three-quarters of a mile from a subway stop
	Base Building Description
Image	▶ New construction in 2007, with signature all-glass exterior
Floor Plate	▶ There are 31,000 usable SF; the tenth floor is available, not built out; landlord will subdivide ▶ Continuous glass curtain wall ▶ Possible nine-foot finished ceilings ▶ Concrete structure; 20 feet on center column line set back from perimeter; 40-foot back span to core
Amenities	▶ Underground car park, 200 spaces ▶ Landlord recycling program
Infrastructure	▶ Certified LEED Gold, Core & Shell ▶ Adequate electrical power; supplemental cooling available ▶ Floor-by-floor Air Handling Units (AHU) ▶ Common core toilets, 30% water-efficient

ACTIVITY 1

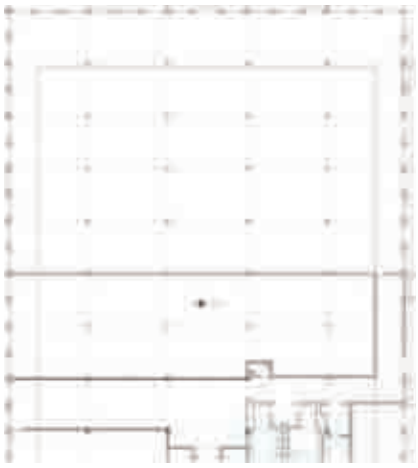
Directions
Worksheet
Content

EVALUATE & SELECT SITE/BUILDING USING LEED FOR COMMERCIAL INTERIORS

Site C: Pilgrim Mill

Site Aerial

Exterior



Ground Floor Plate

North South Section

ACTIVITY 1

Directions
Worksheet
Content

Site C: Pilgrim Mill (continued)

	Site Description
Surroundings	▶ Located in low-density redeveloping industrial district transitioning to a lively mixed-use neighborhood; remediated brownfield
Transportation Access	▶ Approximately one-quarter mile from bus stop served by two bus lines
	Base Building Description
Image	▶ One-story 1920s renovated historic brick factory building with exposed steel and heavy timber structure; remediated brownfield ▶ Oversized industrial windows with deep overhangs; roof clearstories
Floor Plate	▶ There are 21,000 usable SF on first floor, not built out, landlord will sub-divide; 20 x 30-foot steel structural grid; 18 feet to underside of exposed structure
Amenities & Services	▶ On-site green space and stormwater management ▶ Surface parking for 150 cars ▶ Operable windows and operable north-facing roof clearstories
Infrastructure	▶ Adequate electrical power; rooftop units are assigned to the tenant, who can move or add units as needed ▶ Common core toilets, 20% water-efficient

ACTIVITY 1

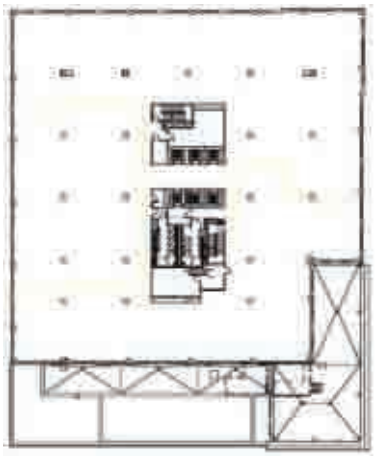
Directions
Worksheet
Content

EVALUATE & SELECT SITE/BUILDING USING LEED FOR COMMERCIAL INTERIORS

Site D: Preston Building

Site Aerial

Exterior



Upper Floor Plate

ACTIVITY 1

Directions
Worksheet
Content

Site D: Preston Building (continued)

	Site Description
Surroundings	▶ Located in a medium-density redeveloping business district of 8- to 10-story buildings
Transportation Access	▶ Located one-half block from subway station with three lines; two-and-a-half blocks from subway station with two lines; three bus lines
	Base Building Description
Image	▶ Mixed-use, nine-story building constructed in 2000; precast concrete, well-insulated envelope with punched openings
Floor Plate	▶ There are 28,000 usable SF on 9th floor; landlord subdivided ▶ High-quality office fit-up in place from previous tenant ▶ 30x30-foot concrete structural grid; 8-foot, 6-inch ceiling height achievable ▶ Tenant can create roof terrace on accessible roof to the south
Amenities & Services	▶ Underground car park, 238 spaces ▶ Fitness center with showers ▶ Landlord recycling ▶ Green cleaning program
Infrastructure	Adequate electrical power; supplemental cooling available Toilets can be upgraded at tenant's expense Floor-by-floor Air Handling Units (AHU)

ACTIVITY 1

Directions
Worksheet
Content

EVALUATE & SELECT SITE/BUILDING USING LEED FOR COMMERCIAL INTERIORS

Site E: The Centrum

Site Aerial

Exterior

Upper Floor Plate

ACTIVITY 1

Directions
Worksheet
Content

Site E: The Centrum (continued)

	Site Description
Surroundings	▶ Located in a landscaped, high-density suburban office park consisting of 10- to 20-story buildings; excellent access to major expressways and proximity to airport
Transportation Access	▶ Distance of one-and-a-half miles from a commuter rail station
	Base Building Description
Image	▶ Office building of 19 stories, constructed in 2007; glass envelope
Floor Plate	▶ There are 27,000 usable SF on the eighth floor; landlord will subdivide; nine-foot ceiling height achievable ▶ There are 20,000 usable SF on the first floor; 14-foot ceiling height achievable ▶ Steel structure; 20-foot column spacing at perimeter; 40-foot perimeter-to-core column free clear span
Amenities & Services	▶ Structured parking deck, 300 spaces; surface parking lot, 100 spaces
Infrastructure	▶ State of the art MEP systems; rooftop central HVAC plant; supplemental cooling available ▶ Vegetated roof covers 80% of roof surface ▶ Common core toilets, 30% water-efficient

ACTIVITY 2

Directions
Worksheet

UNDERSTANDING THE DESIGN CHARRETTE

Objectives

The objective of this activity is to recognize the importance and inter-relationship of different project perspectives in a LEED design charrette process, as well as how these perspectives impact project management, design, and construction decisions.

Directions

You are on a LEED project team, which is in the concept design phase. Using the building that your group selected in Activity 1 for your tenant, your group will conduct a charrette, focusing on two LEED issue clusters:

- Indoor Air Quality / Ventilation
- Spatial Organization / Program / Daylight / Energy Use

1. As you conduct the charrette, be sure to bring the following perspectives to the discussion, either through role-play (i.e., assign each of these roles to the group members) or through collective consideration of the unique points of view these roles bring:
   - Tenant / owner
   - Architect / interior designer / furniture specifier
   - General contractor
   - MEP engineer
   - Base building management staff
   - Specialists, such as lighting designer or acoustician
2. Take a few minutes to review the activity worksheet you will complete and the information on your Tenant Case Study, including your selected building.
   - Consider how the constraints and opportunities of your selected building impact the two issue clusters.
3. As a group, take 15 minutes to conduct a charrette that addresses the following concerns:
   - Consider the relationships between the LEED credits within each issue cluster, such as:
     - What tradeoffs are there between increased fresh air and energy consumption?
     - What impact will the location of hard-walled rooms have on daylight and views?

ACTIVITY 2

Directions
Worksheet

UNDERSTANDING THE DESIGN CHARRETTE

(CONTINUED)

- What are the schedule impact implications of each credit?
- Who should take primary responsibility for each credit's planning and execution? What other parties should be involved?
- What should be the next steps for each issue?

4. Complete the empty worksheet fields. Assign the credits to the appropriate parties, determine the critical decision phase and possible strategies, and create follow-up assignments.

5. Your facilitator will stop you after 20 minutes to initiate a discussion, asking one group from each Tenant Case Study and site to report out to the class.

ACTIVITY 2

Directions
Worksheet

UNDERSTANDING THE DESIGN CHARRETTE

Worksheet

Note: This tool represents a way to manage a process, but is not a requirement for LEED.

				[Who?]	[Who Else?]	[When?]	[What?]	[What Else?]
Issue Clusters	**Credit No.**	**Point Value**	**Credit Name**	**Primary Responsible Party**	**Other Influencing Parties**	**Critical Decision and/or Execution Phase**	**Potential Strategies**	**Follow-up Assignments**
IAQ Ventilation	IEQ c1	1	Outdoor Air Delivery Monitoring					
	IEQ c2	1	Increased Ventilation [>30%]					
	IEQ c3.1	1	Construction Indoor Air Quality Management Plan – During Construction					
	IEQ c3.2	1	Construction Indoor Air Quality Management Plan – Before Occupancy					
			Option 2 Air Testing					
			Option 1 Flush-out					

ACTIVITY 2

Directions
Worksheet

UNDERSTANDING THE DESIGN CHARRETTE

Worksheet (continued)

					[Who?]	[Who Else?]	[When?]	[What?]	[What Else?]
Issue Clusters	**Credit No.**	**Point Value**	**Credit Name**		**Primary Responsible Party**	**Other Influencing Parties**	**Critical Decision and/or Execution Phase**	**Potential Strategies**	**Follow-up Assignments**
Spatial Organization Program Daylight Energy Use	EA c1.2		Optimize Energy Performance – Lighting Controls						
		1		Daylight Controls for Day-lit Area					
		1		Daylight Controls for 50% of the Lighting Load					
		1		Occupancy Sensors for 75% of the Connected Lighting Load					
	IEQ c8.1	2	Daylight and Views – Daylight [70%, 90%]						
	IEQ c8.2	1	Daylight and Views – Views for Seated Spaces [90%]						

ACTIVITY 3

Directions
Worksheet
Content

MATERIALS EVALUATION & SELECTION STRATEGIES

Objectives

The objective of this activity is to define what the overall material strategies are for the selected tenant project. This activity will help you recognize important considerations, synergies, and tradeoffs in selecting materials.

Directions

Given a limited set of material options, select materials and confirm if they correspond to LEED credit pursuits based on owner goals and LEED requirements. Explain choices and describe the benefits and tradeoffs of the choices you make.

1. Review the tenant goals with the objectives of this activity in mind.
2. Imagine yourself as the LEED champion coordinating with the tenant commercial interior project team. The project is in the strategic design / design development phase, and you need to collaborate to determine the material strategies that will support and accomplish the owner's goals, including its goal for LEED certification.
3. Individually, take five minutes to review the tenant goals, Materials Selection Matrix, partial LEED scorecard, and activity worksheet that you will complete.
4. As a group, take 15 minutes to discuss the project and develop a materials strategy. Consider the following during your discussion:
   - Does this material support, negate, or have a neutral effect on the owner's goals?
   - Evaluate the schedule, determining how that will factor into the relative importance of that product's contribution to credits.
   - Does the product meet recycled content, regional, low- emitting, or other product-related goals?
   - What are synergies/tradeoffs?
   - Note: Some of the products may need to be reselected.
5. On the worksheet provided, indicate which products your group would support or not, and why. Describe the synergies/tradeoffs with each decision.
6. Your facilitator will stop you after 20 minutes to initiate a discussion of the activity. Be prepared to explain your strategy.

ACTIVITY 3

Directions
Worksheet
Content

MATERIALS EVALUATION & SELECTION STRATEGIES

Worksheet

Directions: Explain your materials strategy for each material selection based on the tenant's LEED goals. Describe the synergies and tradeoffs (pros/cons) on the following worksheet:

Tenant:_____

Tenant Goals/Schedule: _____

_____

_____

_____

Furniture Strategy:

Selected Furniture System: _____

Synergies/Pros:_____

_____

_____

_____

Tradeoffs/Cons: _____

_____

_____

_____

ACTIVITY 3

Directions
Worksheet
Content

Carpet Strategy:

Selected Carpet: _____

Synergies/Pros: _____

_____

_____

_____

Tradeoffs/Cons: _____

_____

_____

_____

Medium Density Fiberboard (MDF) Strategy:

Selected MDF: _____

Synergies/Pros: _____

_____

_____

_____

Tradeoffs/Cons: _____

_____

_____

_____

ACTIVITY 3

Directions
Worksheet
Content

MATERIALS EVALUATION & SELECTION STRATEGIES

Materials Selection Matrix

Note: This tool represents a way to manage a process, but is not a requirement for LEED.

				Credits to Which Products Contribute									
Product	Manufacturer	Budget	Meets Schedule	MR c3.2: Resource Reuse (Furniture)	MR c4: Recycled Content	MR c5.1: Regional Materials (Point of Assembly)	MR c5.2: Regional Materials (Harvested/Extracted)	MR c6: Rapidly Renewable	MR c7: Certified Wood	IEQ c4.3: Low Emitting Carpet	IEQ c4.4: Low Emitting Comp. Wood	IEQ c4.5: Low Emitting Furniture	Total Contribution to Credits
Furniture Systems "A"	Sitting Things, Co.	$$$$	W/IN TWO WEEKS	NO	60%	510	100	NO	75%	N/A	N/A	YES	5
Furniture Systems "B"	Hold Em', LLC	$$$$	YES	YES	50%	400	100	10%	NO	N/A	N/A	YES	3
Medium Density Fiber Board "C"	Real Kewl Board	$$	YES	N/A	100%	200	700	NO	NO	N/A	YES	N/A	3
Medium Density Fiber Board "D"	Yowza Board, Corp.	$$	YES	N/A	75%	150	499	25%	98%	N/A	NO	N/A	5
Carpet "E"	Fuzzy Tiles, Inc.	$$$	YES	N/A	35%	100	400	5%	N/A	YES	N/A	N/A	4
Carpet "F"	Cushion Grass, LLC	$$$	NO	N/A	10%	150	520	NO	N/A	YES	N/A	N/A	3

ACTIVITY 3

Directions
Worksheet
Content

MATERIALS EVALUATION & SELECTION STRATEGIES

Tenant 1: Multi-national Aluminum Company, Government Affairs Division's LEED Scorecard Excerpt

Yes	?	No					
6	0	0	MATERIALS & RESOURCES			9	Points
			Credit 3.1	Materials Reuse		1 to 2	
					5% Reuse	1	
					10% Reuse	2	
			Credit 3.2	Materials Reuse - Furniture and Furnishings		1	
2			Credit 4	Recycled Content		1 to 2	
				1	10% of Content	1	
				2	20% of Content	2	
2			Credit 5	Regional Materials		1 to 2	
				1	20% of Materials Manufactured	1	
				2	20% of Materials Manufactured and 10% Extracted	2	
1			Credit 6	Rapidly Renewable Materials		1	
1			Credit 7	Certified Wood		1	
Yes	?	No					
4	0	1	INDOOR ENVIRONMENTAL QUALITY			5	Points
1			Credit 4.1	Low-Emitting Materials – Adhesives and Sealants		1	
1			Credit 4.2	Low-Emitting Materials – Paints and Coatings		1	
1			Credit 4.3	Low-Emitting Materials – Flooring Systems		1	
1			Credit 4.4	Low-Emitting Materials – Composite Wood and Agrifiber Products		1	
		1	Credit 4.5	Low-Emitting Materials – Systems Furniture and Seating		1	
Yes	?	No					
0	0	0	INNOVATION IN DESIGN			5	Points
			Credit 1	Innovation in Design		1 to 5	
					Innovation or Exemplary Performance	1	

ACTIVITY 3

Directions
Worksheet
Content

MATERIALS EVALUATION & SELECTION STRATEGIES

Tenant 2: Furniture Manufacturing Company, Regional Showroom's LEED Scorecard Excerpt

Yes	?	No					
3	1	0	MATERIALS & RESOURCES			9	Points
			Credit 3.1	Materials Reuse		1 to 2	
					5% Reuse	1	
					10% Reuse	2	
	1		Credit 3.2	Materials Reuse - Furniture and Furnishings		1	
1			Credit 4	Recycled Content		1 to 2	
				1	10% of Content	1	
					20% of Content	2	
2			Credit 5	Regional Materials		1 to 2	
				1	20% of Materials Manufactured	1	
				2	20% of Materials Manufactured and 10% Extracted	2	
			Credit 6	Rapidly Renewable Materials		1	
			Credit 7	Certified Wood		1	
Yes	?	No					
4	0	0	INDOOR ENVIRONMENTAL QUALITY			5	Points
1			Credit 4.1	Low-Emitting Materials – Adhesives and Sealants		1	
1			Credit 4.2	Low-Emitting Materials – Paints and Coatings		1	
1			Credit 4.3	Low-Emitting Materials – Flooring Systems		1	
1			Credit 4.4	Low-Emitting Materials – Composite Wood and Agrifiber Products		1	
			Credit 4.5	Low-Emitting Materials – Systems Furniture and Seating		1	
Yes	?	No					
0	1	0	INNOVATION IN DESIGN			5	Points
			Credit 1	Innovation in Design		1 to 5	
				1	Innovation or Exemplary Performance	1	

ACTIVITY 3

Directions
Worksheet
Content

MATERIALS EVALUATION & SELECTION STRATEGIES

Tenant 3: Real Estate Services Company's LEED Scorecard Excerpt

Yes	?	No					
4	2	0	MATERIALS & RESOURCES			9	Points
			Credit 3.1	Materials Reuse		1 to 2	
					5% Reuse	1	
					10% Reuse	2	
			Credit 3.2	Materials Reuse - Furniture and Furnishings		1	
2			Credit 4	Recycled Content		1 to 2	
				1	10% of Content	1	
				2	20% of Content	2	
2			Credit 5	Regional Materials		1 to 2	
				1	20% of Materials Manufactured	1	
				2	20% of Materials Manufactured and 10% Extracted	2	
	1		Credit 6	Rapidly Renewable Materials		1	
	1		Credit 7	Certified Wood		1	
Yes	?	No					
5	0	0	INDOOR ENVIRONMENTAL QUALITY			5	Points
1			Credit 4.1	Low-Emitting Materials – Adhesives and Sealants		1	
1			Credit 4.2	Low-Emitting Materials – Paints and Coatings		1	
1			Credit 4.3	Low-Emitting Materials – Flooring Systems		1	
1			Credit 4.4	Low-Emitting Materials – Composite Wood and Agrifiber Products		1	
1			Credit 4.5	Low-Emitting Materials – Systems Furniture and Seating		1	
Yes	?	No					
0	0	0	INNOVATION IN DESIGN			5	Points
			Credit 1	Innovation in Design		1 to 5	
					Innovation or Exemplary Performance	1	

ACTIVITY 4

Directions
Worksheet
Content

COMPLETING A LEED ONLINE CREDIT FORM, INCLUDING SUPPORTING DOCUMENTATION

Objective

The objective of this activity is to complete a LEED Online credit form and to identify, develop, and coordinate supporting documentation.

Directions

You are a team member assigned to develop and document Indoor Environmental Quality Credit 6.1, Controllability of Systems – Lighting. You are developing a lighting control plan for the project and in parallel, are completing the LEED Online credit form, which involves assigning lighting control strategies for the different zones from the options provided.

Review the information below and on the next pages, complete the LEED Online credit form, and select the best supporting documentation on the worksheets provided.

1. Review the activity worksheet you will complete, "IEQ Credit 6.1, Controllability of Systems – Lighting" LEED Online credit form, intents, and requirements, and the background information for the case study.
2. Complete the LEED Online credit form provided, selecting the best supporting documentation and describing any additional documentation.
3. Your instructor will stop you after 10 minutes to initiate a discussion of the activity. Be prepared to discuss how you completed the form and explain your documentation selections.
4. Questions to consider: How would you integrate this activity into a project work plan?

Lighting Goals

The tenant desires a high degree of lighting control throughout the showroom customer areas to support a variety of display situations and events. Individual controllability for staff is required.

ACTIVITY 4

Directions
Worksheet
Content

Worksheet: IEQ c6.1 Credit Form

Table. Lighting Controls

Space (or Space Group) ID	Occupancy Type	Quantity	Lighting Control Type	Lighting Control Description
Reception 101, 102, 103	Shared multi-occupant	3 spaces	Multiple mode	1 switch zone & 1 dimmer zone
Conference 104, 108, 110		3 spaces		
Hoteling / Visitor 112, 113		occupants		
Copy Room 117		spaces		
Office 118	Individual	occupants	Multiple mode	task light with dimmer
Workstations		11 occupants		

Choose from the following options to complete the missing fields in the Lighting Controls table in the LEED Online credit form:

Occupancy Types
- Individual
- Shared multi-occupant
- Classroom
- Other learning space

Lighting Control Types
- On/Off only
- Multiple mode
- Dimmer
- None

Lighting Control Description
- One (1) switch zone and one (1) dimmer zone
- Three (3) dimmer zones
- Switch/occupancy sensor
- Task light

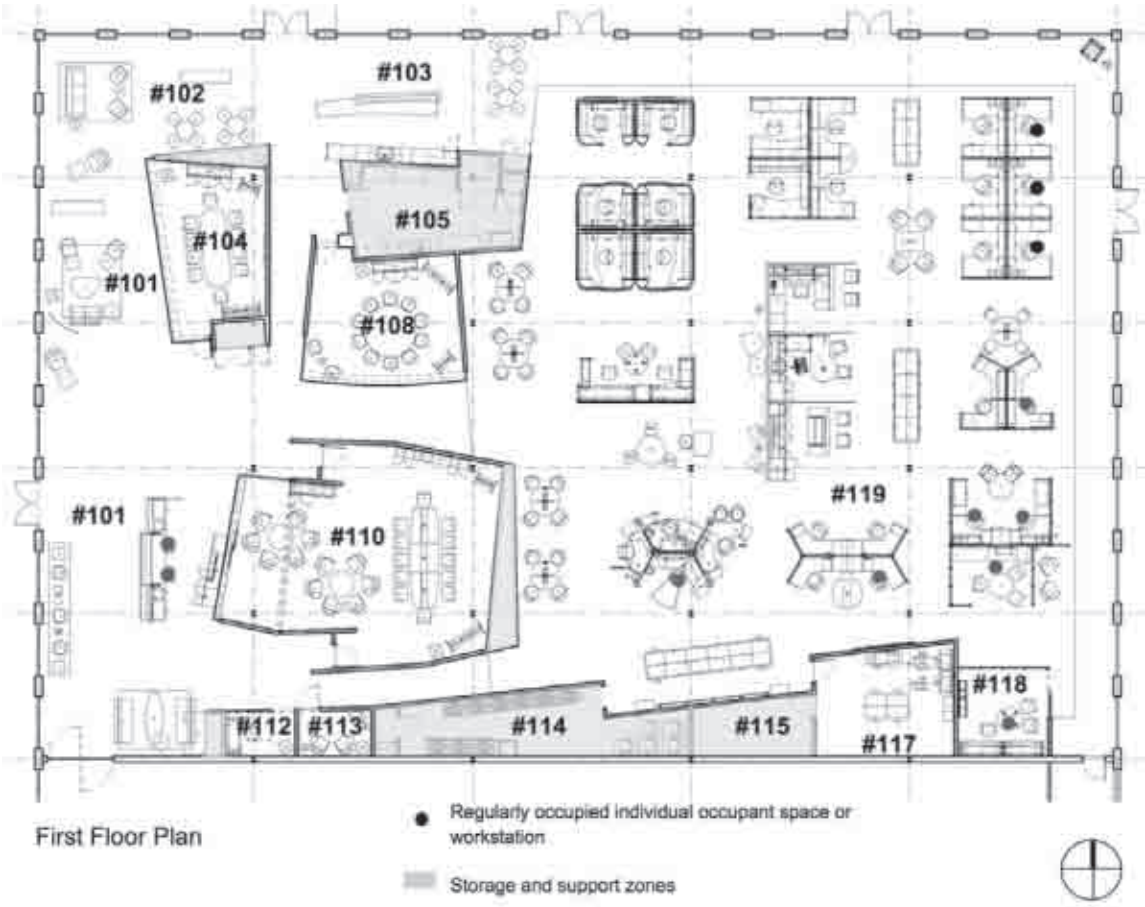
Additional Documentation Options
- Narrative
- Product data cut sheets
- Lighting control schedule
- Photographs

ACTIVITY 4

Directions
Worksheet
Content

COMPLETING A LEED ONLINE CREDIT FORM, INCLUDING SUPPORTING DOCUMENTATION

Furniture Manufacturing Company Regional Showroom



ACTIVITY 4

Directions
Worksheet
Content

COMPLETING A LEED ONLINE CREDIT FORM, INCLUDING SUPPORTING DOCUMENTATION

Credit Information

IEQ Credit 6.1 Controllability of Systems – Lighting

1 point

Intent

To provide a high level of lighting system control for individual occupants or groups in multi-occupant spaces (e.g., classrooms and conference areas) and promote their productivity, comfort and well-being.

Requirements

Provide individual lighting controls for: 90% (minimum) of the tenant space occupants to enable adjustments to suit individual task needs and preferences. Provide lighting system controls for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences.

Potential Technologies & Strategies

Design the tenant space with occupant controls for lighting. Strategies to consider include lighting controls and task lighting. Integrate lighting systems controllability into the overall lighting design, providing ambient and task lighting while managing the overall energy use of the building.

Definitions

In **individual occupant spaces**, workers use standard workstations to conduct individual tasks. Examples are private offices and open office areas with multiple workers.

Shared (**group**) **multi-occupant spaces** include conference rooms, classrooms, and other indoor spaces used as places of congregation.

ACTIVITY 5

Directions
Worksheet

ANALYZE LEED PROGRESS REPORTS TO MONITOR STATUS OF CREDITS DURING CONSTRUCTION

Objective

The objective of this activity is to provide an opportunity to practice monitoring compliance during construction to alleviate the loss of LEED credits.

Directions

Your team's tenant commercial interior project is now in construction and you have a construction meeting next week. As the LEED champion, be prepared to report:

- The issues status relative to LEED prerequisites/credits;
- Risks to meeting LEED goals; and
- Possible solutions/next steps to risk issues.

1. Take five minutes to review the activity worksheet you will complete. The issues noted in the worksheet are derived from the three tenant case studies in this course.
2. Take five minutes to complete the worksheet by filling in the potential risks and possible solutions/next steps.
3. Your facilitator will stop you after 10 minutes to initiate a discussion of the activity. Be prepared to discuss the status, risks, and possible solutions/next steps for the case. If you complete your worksheet early, look at the other tenants' issues and consider recommendations.

ACTIVITY 5

Directions
Worksheet

ANALYZE LEED PROGRESS REPORTS TO MONITOR STATUS OF CREDITS DURING CONSTRUCTION

Worksheet

Potential Issue	Associated LEED Credit(s)	Risks	Possible Solutions
Example:			
Base building is not providing needed documentation and is holding up the LEED design phase submittal.	Primarily SS c1	**Example of potential risks:** 1. Construction moves ahead and the benefit of getting "early feedback" from split submittal design phase review is lost. 2. What if base building does not produce needed documentation even for the construction phase? Potential credit loss.	**Example of potential solutions/ next steps:** 1. Is it possible to take photographs of what is needed for documentation? 2. Contact the architect of record or other original team members for the documentation. 3. Consider leverage with base building, if any. 4. Consider including base building documentation as part of the contract in the future.

ACTIVITY 5

Directions
Worksheet

Worksheet (continued)

Tenant 1: Aluminum Company			
Potential Issue	**Associated LEED Credit(s)**	**Risks**	**Possible Solutions**
The daylight sensors are not functioning properly because they are unable to scan the entire room.	EA p1 EA c2 EA c1.2		
The current design includes glass doors to all offices and other key areas to maximize views to the exterior. However, in some key rooms such as the lunch room/ break-out areas, the occupants may need visual privacy.	IEQ c8.2		

Worksheet (continued)

Tenant 2: Furniture Manufacturing Company			
Potential Issue	**Associated LEED Credit(s)**	**Risks**	**Possible Solutions**
Base building has operable windows.	EA c1 IEQ c2 IEQ c6.2		
Concrete during demolition has a coating on it. The construction waste diversion team cannot find a recycling location that will accept the coated concrete.	MR c2.1-2.2		

Worksheet (continued)

Tenant 3: Real Estate Services Company			
Potential Issue	**Associated LEED Credit(s)**	**Risks**	**Possible Solutions**
The project is located in Washington, D.C., and is reusing furniture in two ways for the new tenant space. Furniture Group A is being reused in the D.C. office; furniture Group B is being sent to the Virginia office.	MR c3.3 and ID Credit for Exemplary Performance		
An air quality flush-out was in the original schedule. However, the schedule has become accelerated, and now there is concern over potential punch list items not being complete; plus, the tenant needs to occupy the space.	IEQ c3.2		

APPENDIX A

LEED for Commercial Interiors Checklist

LEED 2009 for Commercial Interiors

Project Checklist

Project Name

Date

Y	?	N				
			Sustainable Sites		Possible Points:	**21**
			Credit 1	Site Selection		1 to 5
			Credit 2	Development Density and Community Connectivity		6
			Credit 3.1	Alternative Transportation—Public Transportation Access		6
			Credit 3.2	Alternative Transportation—Bicycle Storage and Changing Rooms		2
			Credit 3.3	Alternative Transportation—Parking Availability		2
			Water Efficiency		Possible Points:	**11**
Y			Prereq 1	Water Use Reduction—20% Reduction		
			Credit 1	Water Use Reduction		6 to 11
			Energy and Atmosphere		Possible Points:	**37**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems		
Y			Prereq 2	Minimum Energy Performance		
Y			Prereq 3	Fundamental Refrigerant Management		
			Credit 1.1	Optimize Energy Performance—Lighting Power		1 to 5
			Credit 1.2	Optimize Energy Performance—Lighting Controls		1 to 3
			Credit 1.3	Optimize Energy Performance—HVAC		5 to 10
			Credit 1.4	Optimize Energy Performance—Equipment and Appliances		1 to 4
			Credit 2	Enhanced Commissioning		5
			Credit 3	Measurement and Verification		2 to 5
			Credit 4	Green Power		5
			Materials and Resources		Possible Points:	**14**
Y			Prereq 1	Storage and Collection of Recyclables		
			Credit 1.1	Tenant Space—Long-Term Commitment		1
			Credit 1.2	Building Reuse		1 to 2
			Credit 2	Construction Waste Management		1 to 2
			Credit 3.1	Materials Reuse		1 to 2
			Credit 3.2	Materials Reuse—Furniture and Furnishings		1
			Credit 4	Recycled Content		1 to 2
			Credit 5	Regional Materials		1 to 2
			Credit 6	Rapidly Renewable Materials		1
			Credit 7	Certified Wood		1

Y	?	N				
			Indoor Environmental Quality		Possible Points:	**17**
Y			Prereq 1	Minimum IAQ Performance		
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control		
			Credit 1	Outdoor Air Delivery Monitoring		1
			Credit 2	Increased Ventilation		1
			Credit 3.1	Construction IAQ Management Plan—During Construction		1
			Credit 3.2	Construction IAQ Management Plan—Before Occupancy		1
			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants		1
			Credit 4.2	Low-Emitting Materials—Paints and Coatings		1
			Credit 4.3	Low-Emitting Materials—Flooring Systems		1
			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products		1
			Credit 4.5	Low-Emitting Materials—Systems Furniture and Seating		1
			Credit 5	Indoor Chemical & Pollutant Source Control		1
			Credit 6.1	Controllability of Systems—Lighting		1
			Credit 6.2	Controllability of Systems—Thermal Comfort		1
			Credit 7.1	Thermal Comfort—Design		1
			Credit 7.2	Thermal Comfort—Verification		1
			Credit 8.1	Daylight and Views—Daylight		1 to 2
			Credit 8.2	Daylight and Views—Views for Seated Spaces		1
			Innovation and Design Process		Possible Points:	**6**
			Credit 1.1	Innovation in Design: Specific Title		1
			Credit 1.2	Innovation in Design: Specific Title		1
			Credit 1.3	Innovation in Design: Specific Title		1
			Credit 1.4	Innovation in Design: Specific Title		1
			Credit 1.5	Innovation in Design: Specific Title		1
			Credit 2	LEED Accredited Professional		1
			Regional Priority Credits		Possible Points:	**4**
			Credit 1.1	Regional Priority: Specific Credit		1
			Credit 1.2	Regional Priority: Specific Credit		1
			Credit 1.3	Regional Priority: Specific Credit		1
			Credit 1.4	Regional Priority: Specific Credit		1
			Total		Possible Points:	**110**

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

APPENDIX B

EXEMPLARY PERFORMANCE MATRIX

SUSTAINABLE SITES		
CREDIT	**EXEMPLARY PERFORMANCE ELIGIBILITY**	**THRESHOLD**
SS Credit I: Site Selection, Option 2: PATH 4: Heat Island Effect – Nonroof	Projects may earn credit for exemplary performance under SS Credit 1, Path 12, Other Quantifiable Environmental Performance, by demonstrating that two or more of the compliance paths described above have been met.	2 or more compliance paths
SS Credit I: Site Selection, Option 2: PATH 5: Heat Island Effect – Roof	Projects may earn credit for exemplary performance under SS Credit 1, Path 12, Other Quantifiable Environmental Performance, by demonstrating that 100% of the building's roof area (excluding mechanical equipment, photovoltaic panels, and skylights) consists of a vegetated roof system.	100%
SS Credit 1: Option 2: PATH 10: Water Use Reduction	Projects may earn an exemplary performance credit under SS Credit 1, Path 12, Other Quantifiable Environmental Performance, by demonstrating a 40% water use reduction for the whole building.	40%
SS Credit 1: Option 2: PATH 11: On-site Renewable Energy	Projects may earn an exemplary performance credit under SS Credit 1, Path 12, Other Quantifiable Environmental Performance, by demonstrating that on-site renewable energy accounts for 10% or more of the annual building energy cost.	10%

WATER EFFICIENCY		
CREDIT	**EXEMPLARY PERFORMANCE ELIGIBILITY**	**THRESHOLD**
WE Credit 1: Water Use Reduction	Projects may earn an innovation point for exemplary performance by demonstrating 45% reduction in projected potable water use.	45%

ENERGY AND ATMOSPHERE		
CREDIT	**EXEMPLARY PERFORMANCE ELIGIBILITY**	**THRESHOLD**
EA Credit 1.1: Optimize Energy Performance – Lighting Power	Project teams may earn an exemplary performance point by reducing the lighting power density 40% or more below the standard.	40%
EA Credit 1.2: Optimize Energy Performance – Lighting Controls	Project teams may earn an exemplary performance point by implementing daylight-responsive controls for 75% of the connected lighting load or by installing occupancy-responsive controls for 95% of the connected lighting load.	75%
EA Credit 1.3: Optimize Energy Performance – HVAC	Projects that use Option 2 and demonstrate that HVAC system component performance for the tenant space is 33% more efficient than a system that is in minimum compliance with ASHRAE 90.1–2007 are eligible to earn 1 point under Innovation in Design.	33%
EA Credit 1.4: Optimize Energy Performance – Equipment and Appliances	Projects may earn an exemplary performance credit under Innovation in Design by achieving a rated power of 97% attributable to ENERGY STAR–qualified equipment and appliances.	97%
EA Credit 4: Green Power	Project teams may earn an Innovation in Design point for exemplary performance by meeting 100% of the calculated annual use (or a default of 16 kWh per square foot per year) through contracted green power.	100% or a default of 16 kWh

APPENDIX B

MATERIALS AND RESOURCES		
CREDIT	**EXEMPLARY PERFORMANCE ELIGIBILITY**	**THRESHOLD**
MR Credit 1.2: Building Reuse – Maintain Interior Nonstructural Components	Project teams may earn an Innovation in Design credit for exemplary performance by reusing 80% or more of the existing walls, flooring, and ceiling systems.	80%
MR Credit 2: Construction Waste Management	Project teams may earn an Innovation in Design credit for exemplary performance by diverting 95% or more of total construction waste.	95%
MR Credit 3.1: Materials Reuse	Project teams may earn an Innovation in Design credit for exemplary performance if the value of salvaged or reused materials used on the project is 15% or more of the total materials cost.	15%
MR Credit 3.2: Materials Reuse – Furniture and Furnishings	Project teams may earn an Innovation in Design credit for exemplary performance by using at least 60% salvaged, refurbished, or reused furniture and furnishings.	60%
MR Credit 4: Recycled Content	Project teams may earn an Innovation in Design credit for exemplary performance by achieving a total recycled-content value of 30% or more.	30%
MR Credit 5: Regional Materials	Project teams may earn an Innovation in Design credit for exemplary performance by achieving a total value of regionally harvested, extracted, and manufactured materials of 20% or more.	20%
MR Credit 6: Rapidly Renewable Materials	Project teams may earn an Innovation in Design credit for exemplary performance by achieving a rapidly renewable materials content of 10% or more.	10%
MR Credit 7: Certified Wood	Project teams may earn an Innovation in Design credit for exemplary performance by achieving an FSC-certified wood content of 95% or more of the project's total new wood.	95%

INDOOR ENVIRONMENTAL QUALITY		
CREDIT	**EXEMPLARY PERFORMANCE ELIGIBILITY**	**THRESHOLD**
IEQ Credit 8.2: Daylight and Views – Views for Seated Spaces	Exemplary performance may be demonstrated for this credit by meeting two of the four following measures: 1. 90% or more of regularly occupied spaces have multiple lines of sight to vision glazing in different directions at least 90 degrees apart. 2. 90% or more of regularly occupied spaces have views that include views of at least two of the following: 1) vegetation, 2) human activity, or 3) objects at least 70 feet from the exterior of the glazing. 3. 90% or more of regularly occupied spaces have access to unobstructed views located within the distance of three times the head height of the vision glazing. 4. 90% or more of regularly occupied spaces have access to views with a view factor of 3 or greater, per the Heschong Mahone Group study, Windows and Offices; A Study of Office Worker Performance and the Indoor Environment, page 47, for their primary view (seated at workstation, facing computer screen). See: http://h-m-g.com/downloads/Daylighting/day_registration_form.htm to download the report at no charge.	2 of 4 measures

GLOSSARY

Adapted (or introduced) plants reliably grow well in a given habitat with minimal winter protection, pest control, fertilization, or irrigation once their root systems are established. Adapted plants are considered low maintenance and not invasive.

Adaptive reuse is the renovation of a space for a purpose different from the original.

An **adhesive** is any substance used to bond 1 surface to another by attachment. Adhesives include bonding primers, adhesive primers, and adhesive primers for plastics. (SCAQMD Rule 1168)

Aerosol adhesive is an aerosol product in which the spray mechanism is permanently housed in a nonrefillable can. Designed for hand-held application, these products do not need ancillary hoses or spray equipment. Aerosol adhesives include special-purpose spray adhesives, mist spray adhesives, and web spray adhesives. (SCAQMD Rule 1168)

Agrifiber products are made from agricultural fiber. Examples include particleboard, medium-density fiberboard (MDF), plywood, oriented-strand board (OSB), wheatboard, and strawboard.

Air-conditioning is the process of treating air to meet the requirements of a conditioned space by controlling its temperature, humidity, cleanliness, and distribution. (ASHRAE 62.1–2007)

Air-handling units (AHUs) are mechanical indirect heating, ventilating, or air-conditioning systems in which the air is treated or handled by equipment located outside the rooms served, usually at a central location, and conveyed to and from the rooms by a fan and a system of distributing ducts. (NEEB, 1997 edition)

Albedo is synonymous with **solar reflectance.**

Alternative daily cover is material (other than earthen material) that is placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging.

Alternative-fuel vehicles use low-polluting, nongasoline fuels such as electricity, hydrogen, propane, compressed natural gas, liquid natural gas, methanol, and ethanol. In LEED, efficient gas-electric hybrid vehicles are included in this group.

Anticorrosive paints are coatings formulated and recommended for use in preventing the corrosion of ferrous metal substrates.

Aquatic systems are ecologically designed treatment systems in which a diverse community of biological organisms (e.g., bacteria, plants, fish) treat wastewater.

An **aquifer** is an underground water-bearing rock formation or group of formations that supply groundwater, wells, or springs.

An **area-weighted SRI is** a weighted average calculation that may be performed for buildings with multiple roof surfaces to demonstrate that the total roof area has an average solar reflectance index equal to or greater than that of a theoretical roof 75% of whose surfaces have an SRI of 78 and 25% have an SRI of 30.

Architectural porous sealant primer is a substance used as a sealant on porous materials.

An **assembly** can be either a product formulated from multiple materials (e.g., concrete) or a product made up of subcomponents (e.g., a workstation).

Assembly recycled content is the percentage of material in a product that is either postconsumer or preconsumer recycled content. It is determined by dividing the weight of the recycled content by the overall weight of the assembly.

The **attendance boundary** is used by school districts to determine which students attend what school based on where they live.

Automatic fixture sensors are motion detectors that automatically turn on and turn off lavatories, sinks, water closets, and urinals. Sensors can be hard wired or battery operated.

Baseline building performance is the annual energy cost for a building design intended for use as a baseline for rating above standard design, as defined in ANSI/ASHRAE/IESNA Standard 90.1–2007, Informative Appendix G.

Baseline irrigation water use is the amount of water used by conventional irrigation in the region.

Basis of design includes design information necessary to accomplish the owner's project requirements, including system descriptions, indoor environmental quality criteria, design assumptions, and references to applicable codes, standards, regulations, and guidelines.

GLOSSARY

Bicycle racks, in LEED, include outdoor bicycle racks, bicycle lockers, and indoor bicycle storage rooms.

Bicycle maintenance programs are intended for employees who ride bicycles to work and may include coupons for yearly bicycle tune-ups or having supplies on site for basic self-repairs (e.g., tire pump, patch kit).

Bicycle route assistance is intended for employees and customers and may include a map identifying bicycle routes to the project site, posted in a location on the property that is easily accessible to employees and customers; it can also be posted online.

Biochemical oxygen demand is a measure of how fast biological organisms use up oxygen in a body of water. It is used in water quality management and assessment, ecology, and environmental science.

Biodiversity is the variety of life in all forms, levels, and combinations, including ecosystem diversity, species diversity, and genetic diversity.

Biofuel-based energy systems are electrical power systems that run on renewable fuels derived from organic materials, such as wood by-products and agricultural waste. In LEED, biofuels include untreated wood waste (e.g., mill residues), agricultural crops or waste, animal waste and other organic waste, and landfill gas.

Biofuel-based systems are power systems that run on renewable fuels derived from organic materials, such as wood by-products and agricultural waste. Examples of biofuels include untreated wood waste, agricultural crops and residues, animal waste, other organic waste, and landfill gas.

Biological control is the use of chemical or physical water treatments to inhibit bacterial growth in cooling towers.

Biomass is plant material from trees, grasses, or crops that can be converted to heat energy to produce electricity.

Blackwater definitions vary, but wastewater from toilets and urinals is always considered blackwater. Wastewater from kitchen sinks (perhaps differentiated by the use of a garbage disposal), showers, or bathtubs is considered blackwater under some state or local codes.

Bleed-off, or **blowdown**, is the release of a portion of the recirculating water from a cooling tower; this water carries dissolved solids that can cause mineral buildup.

The **breathing zone** is the region within an occupied space between 3 and 6 feet above the floor and more than 2 feet from walls or fixed air-conditioning equipment. (AHSRAE 62.1–2007)

A **brownfield** is real property whose use may be complicated by the presence or possible presence of a hazardous substance, pollutant, or contaminant.

A **building automation system (BAS)** uses computer-based monitoring to coordinate, organize, and optimize building control subsystems, including lighting, equipment scheduling, and alarm reporting.

Building density is the floor area of the building divided by the total area of the site (square feet per acre).

The **building envelope**, or shell, is the exterior surface of a building's construction—the walls, windows, roof, and floor.

Building footprint is the area on a project site used by the building structure, defined by the perimeter of the building plan. Parking lots, landscapes, and other nonbuilding facilities are not included in the building footprint.

Business hours are the regularly scheduled hours of occupancy. These include all hours when the building is open to the public, as well as any regularly scheduled activities (such as standard daily preopening or postclosing activities).

A **campus** or **private bus** is a bus or shuttle service that is privately operated and not available to the general public. In LEED, a campus or private bus line that falls within 1/4 mile of the project site and provides transportation service to the public can contribute to earning credits.

Carbon dioxide (CO2) levels are an indicator of ventilation effectiveness inside buildings. CO2 concentrations greater than 530 ppm above outdoor CO2 conditions generally indicate inadequate ventilation. Absolute concentrations of CO2 greater than 800 to 1,000 ppm generally indicate poor air quality for breathing.

A **carpool** is an arrangement by which 2 or more people share a vehicle for transportation.

GLOSSARY

Chain-of-custody (COC) is a tracking procedure for a product from the point of harvest or extraction to its end use, including all successive stages of processing, transformation, manufacturing, and distribution.

Chain-of-custody certification is awarded to companies that produce, sell, promote, or trade forest products after audits verify proper accounting of material flows and proper use of the Forest Stewardship Council name and logo. The COC certificate number is listed on invoices for nonlabeled products to document that an entity has followed FSC guidelines for product accounting.

Chemical treatment includes the use of biocidal, conditioning, dispersant, and scale-inhibiting chemicals to control biological growth, scale, and corrosion in cooling towers. Alternatives to conventional chemical treatment include ozonation, ionization, and exposure to ultraviolet light.

Chlorofluorocarbons (CFCs) are hydrocarbons that are used as refrigerants and cause depletion of the stratospheric ozone layer.

Churn is the movement of workstations and people within a space.

Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). (U.S. Environmental Protection Agency, 2008)

A **coating** is applied to beautify, protect, or provide a barrier to a surface. **Flat coatings** register a gloss of less than 15 on an 85-degree meter or less than 5 on a 60-degree meter. **Nonflat coatings** register a gloss of 5 or greater on a 60-degree meter and a gloss of 15 or greater on an 85-degree meter. (SCAQMD Rule 1113)

Combined heat and power (CHP), or **cogeneration**, generates both electrical power and thermal energy from a single fuel source.

Comfort criteria are specific design conditions that take into account temperature, humidity, air speed, outdoor temperature, outdoor humidity, seasonal clothing, and expected activity. (ASHRAE 55–2004)

Commercial process water is used in operational processes related to a product or service, such as dishwashing, clothes washing, and ice making.

Commissioning (Cx) is the process of verifying and documenting that a building and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements.

The **commissioning authority (CxA)** is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the owner, designer, and contractor to ensure that complex systems are installed and function in accordance with the owner's project requirements.

The **commissioning cycle** is the schedule of activities related to existing building commissioning, including the investigation and analysis, implementation, and ongoing commissioning.

The **commissioning plan** is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

The **commissioning process** is a systematic quality-focused effort to ensure that building systems are designed, specified, procured, installed, and functioning in accordance with the owner's intent. The process uses planning, documentation, and verification of testing to review and oversee the activities of both designer and constructor.

The **commissioning report** documents the commissioning process, including a commissioning program overview, identification of the commissioning team, and description of the commissioning process activities.

Commissioning specification is the contract language used in the construction documents to detail the objective, scope, and implementation of the construction and acceptance phases of the commissioning process as developed in the design phase of the commissioning plan. This allows the construction contractor to ensure that these activities are considered in proposals for the construction work.

The **commissioning team** includes those people responsible for working together to carry out the commissioning process.

Completed design area is the total area of finished ceilings, floors, full-height walls and demountable partitions, interior doors, and built-in case goods in the completed project. It does not include exterior windows and doors.

Composite wood consists of wood or plant particles or fibers bonded by a synthetic resin or binder. Examples include particleboard, medium-density fiberboard (MDF), plywood, oriented-strand board (OSB), wheatboard, and strawboard.

GLOSSARY

Composting toilet system. See **nonwater toilet system.**

The **Comprehensive Environmental Response, Compensation, and Liability Act**, or CERCLA, is more commonly known as Superfund. Enacted in 1980, CERCLA addresses abandoned or historical waste sites and contamination by taxing the chemical and petroleum industries and providing federal authority to respond to releases of hazardous substances.

A **compressed workweek** rearranges the standard workweek (5 consecutive 8-hour days in a week), increasing the daily hours and decreasing the number of days in the work cycle. For example, instead of working 8-hour days Monday through Friday, employees work 10-hour days for 4 days per week, or 9-hour days for 9 of 10 consecutive days.

Concentration ratio is the ratio of the level of dissolved solids in the recirculating water to the level found in the entering makeup water. A higher concentration ratio results from a lower bleed-off rate; increasing the ratio above a certain point, however, leads to scaling, and water savings diminish after a certain level. This ratio is also called the cycles of concentration. Cycles refers to the number of times dissolved minerals in the water are concentrated compared with makeup water, not to water flow over the tower or to on-off cycles.

Conditioned space is the part of a building that is heated or cooled, or both, for the comfort of occupants. (ASHRAE 62.1–2007)

A **constructed wetland** is an engineered system designed to simulate natural wetland functions for water purification. In LEED, constructed wetlands are essentially treatment systems that remove contaminants from wastewater.

Construction and demolition debris includes waste and recyclables generated from construction and from the renovation, demolition, or deconstruction of preexisting structures. It does not include land-clearing debris, such as soil, vegetation, and rocks.

Construction, demolition, and land-clearing debris includes all of the above plus soil, vegetation, and rock from land clearing.

A **construction IAQ management plan** outlines measures to minimize contamination in a specific project building during construction and describes procedures to flush the building of contaminants prior to occupancy.

Contaminants are unwanted airborne elements that may reduce indoor air quality. (ASHRAE 62.1–2007)

Controls are mechanisms that allow occupants to direct power to devices (e.g., lights, heaters) or adjust devices or systems within in a range (e.g., brightness, temperature).

Conventional irrigation refers to the most common irrigation system used in the region where the building is located. A conventional irrigation system commonly uses pressure to deliver water and distributes it through sprinkler heads above the ground.

A **cooling tower** uses water to absorb heat from air-conditioning systems and regulate air temperature in a facility.

Curfew hours are locally determined times when lighting restrictions are imposed. When no local or regional restrictions are in place, 10:00 p.m. is regarded as a default curfew time.

Daylighting is the controlled admission of natural light into a space, used to reduce or eliminate electric lighting.

Daylight-responsive lighting controls are photosensors used in conjunction with other switching and dimming devices to control the amount of artificial lighting in relationship to the amount and quality of natural daylight.

Densely occupied space is an area with a design occupant density of 25 people or more per 1,000 square feet (40 square feet or less per person).

Density factor (k_d) is a coefficient used in calculating the landscape coefficient. It modifies the evapotranspiration rate to reflect the water use of a plant or group of plants, particularly with reference to the density of the plant material.

Design light output is the light output of lamps at 40% of their useful life.

The **development footprint** is the area affected by development or by project site activity. Hardscape, access roads, parking lots, nonbuilding facilities, and the building itself are all included in the development footprint.

GLOSSARY

A **district energy system** is a central energy conversion plant and transmission and distribution system that provides thermal energy to a group of buildings (e.g., a central cooling plant on a university campus). Central energy systems that provide only electricity are not included.

Downstream equipment consists of all heating or cooling systems, equipment, and controls located within the project building and site associated with transporting thermal energy into heated or cooled spaces. This includes the thermal connection or interface with the district energy system, secondary distribution systems in the building, and terminal units.

Drip irrigation delivers water at low pressure through buried mains and submains. From the submains, water is distributed to the soil through a network of perforated tubes or emitters. Drip irrigation is a high-efficiency type of microirrigation.

Durable goods have a useful life of 2 years or more and are replaced infrequently or may require capital program outlays. Examples include furniture, office equipment, appliances, external power adapters, televisions, and audiovisual equipment.

The **durable goods waste stream** consists of durable goods leaving the project site that are fully depreciated and have reached the end of their useful lives for normal business operations.

Ecological restoration is the process of assisting in the recovery and management of ecological integrity and includes biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices.

Ecologically appropriate site features are natural site elements that maintain or restore the ecological integrity of the site. Examples include native or adapted vegetation, water bodies, exposed rock, unvegetated ground, and other features that provide habitat value and are part of the historic natural landscape.

An **economizer** is a device used to make building systems more energy efficient. Examples include HVAC enthalpy controls, which are based on humidity and temperature.

An **ecosystem** is a basic unit of nature that includes a community of organisms and their nonliving environment linked by biological, chemical, and physical processes.

Efficacy is the economy of a luminaire, expressed in lumens per watt (lm/W).

An **electrical conductivity (EC) meter** measures the amount of nutrients and salt in water.

Elemental mercury is pure mercury (rather than a mercury-containing compound), the vapor of which is commonly used in fluorescent and other lamp types.

Embodied energy is the energy used during the entire life cycle of a product, including its manufacture, transportation, and disposal, as well as the inherent energy captured within the product itself.

An **emergency ride home program** is a service provided by the employer to ensure that employees who use alternative transportation can go home in an emergency. It also applies to carpool participants whose driver must leave work unexpectedly.

Emissions reduction reporting is the calculating, tracking, and documenting of the greenhouse gas emissions that result directly from energy use and other operations of a building.

Emissivity is the ratio of the radiation emitted by a surface to the radiation emitted by a black body at the same temperature.

An **endangered species** is threatened with extinction because of harmful human activities or environmental factors.

An **energy audit** identifies how much energy a building uses and the purposes for which it is used, and identifies efficiency and cost-reduction opportunities. The American Society of Heating, Refrigerating and Air-Conditioning Engineers uses 3 levels of energy audits: walk-through analysis, energy survey and analysis, and detailed analysis of capital-intensive modifications.

Energy conservation measures are installations or modifications of equipment or systems intended to reduce energy use and costs.

An **energy simulation model, or energy model**, is a computer-generated representation of the anticipated energy consumption of a building. It permits a comparison of energy performance, given proposed energy efficiency measures, with the baseline.

GLOSSARY

An **ENERGY STAR** rating is a measure of a building's energy performance compared with that of similar buildings, as determined by the ENERGY STAR Portfolio Manager. A score of 50 represents average building performance.

Enhanced commissioning is a set of best practices that go beyond fundamental commissioning to ensure that building systems perform as intended by the owner. These practices include designating a commissioning authority prior to the construction documents phase, conducting commissioning design reviews, reviewing contractor submittals, developing a systems manual, verifying operator training, and performing a postoccupancy operations review.

Entryway systems are designed to capture dirt and other debris from occupants entering the building; they can be open floor grates or grilles set over a recessed area.

Environmental tobacco smoke (ETS), or **secondhand smoke**, consists of airborne particles emitted from the burning end of cigarettes, pipes, and cigars, and is exhaled by smokers. These particles contain about 4,000 compounds, up to 50 of which are known to cause cancer.

Erosion is a combination of processes or events by which materials of the earth's surface are loosened, dissolved, or worn away and transported by natural agents (e.g., water, wind, or gravity).

Eutrophication is the increase in chemical nutrients, such as the nitrogen and phosphorus often found in fertilizers, in an ecosystem. The added nutrients stimulate excessive plant growth, promoting algal blooms or weeds. The enhanced plant growth reduces oxygen in the land and water, reducing water quality and fish and other animal populations.

Evapotranspiration is the loss of water by evaporation from the soil and by transpiration from plants. It is expressed in millimeters per unit of time.

Evapotranspiration (ET) rate is the amount of water lost from a vegetated surface in units of water depth. It is expressed in millimeters per unit of time.

Exfiltration is air leakage through cracks and interstices and through the ceilings, floors, and walls.

Exhaust air is removed from a space and discharged outside the building by mechanical or natural ventilation systems.

Existing area is the total area of the building structure, core, and envelope that existed when the project area was selected. Exterior windows and doors are not included.

Existing building commissioning, or retrocommissioning, involves developing a building operation plan that identifies current operating requirements and needs, conducting tests to determine whether building systems are performing optimally in accordance with the plan, and making any necessary repairs or changes.

Facility alterations and additions are discussed in the Introduction of the LEED for Green Building Operations & Maintenance.

Fairtrade is a product certification system overseen by FLO International, which identifies products that meet certain environmental, labor, and development standards.

Fly ash is the solid residue derived from incineration processes. Fly ash can be used as a substitute for Portland cement in concrete.

The **Food Alliance** certifies foods from sustainable farms and ranches that produce natural products, ensure quality control and food safety, responsibly manage water and energy resources, emphasize recycling and responsible waste management, provide a safe work environment, and commit to continuous improvement of sustainable practices.

A **footcandle (fc)** is a measure of light falling on a given surface. One footcandle is defined as the quantity of light falling on a 1-square-foot area from a 1 candela light source at a distance of 1 foot (which equals 1 lumen per square foot). Footcandles can be measured both horizontally and vertically by a footcandle meter or light meter.

Formaldehyde is a naturally occurring VOC found in small amounts in animals and plants but is carcinogenic and an irritant to most people when present in high concentrations, causing headaches, dizziness, mental impairment, and other symptoms. When present in the air at levels above 0.1 ppm, it can cause watery eyes; burning sensations in the eyes, nose, and throat; nausea; coughing; chest tightness; wheezing; skin rashes; and asthmatic and allergic reactions.

Fuel-efficient vehicles have achieved a minimum green score of 40 according to the annual vehicle-rating guide of the American Council for an Energy Efficient Economy.

GLOSSARY

A **full cutoff luminaire** has zero candela intensity at an angle of 90 degrees above the vertical axis (nadir or straight down) and at all angles greater than 90 degrees from straight down. Additionally, the candela per 1,000 lamp lumens does not numerically exceed 100 (10%) at an angle of 80 degrees above nadir. This applies to all lateral angles around the luminaire.

Full-time equivalent (FTE) represents a regular building occupant who spends 40 hours per week in the project building. Part-time or overtime occupants have FTE values based on their hours per week divided by 40. Multiple shifts are included or excluded depending on the intent and requirements of the credit.

Full-time-equivalent building occupants is a measure equal to the total number of hours all building occupants spend in the building during the peak 8-hour occupancy period divided by 8 hours.

In a **fully shielded** exterior light fixture, the lower edge of the shield is at or below the lowest edge of the lamp, such that all light shines down.

Fundamental commissioning is a set of essential best practices used to ensure that building performance requirements have been identified early in the project's development and to verify that the designed systems have been installed in compliance with those requirements. These practices include designating a commissioning authority, documenting the owner's project requirements and basis of design, incorporating commissioning requirements into the construction documents, establishing a commissioning plan, verifying installation and performance of specified building systems, and completing a summary commissioning report.

Furniture includes any retail display fixtures, such as shelving, tables, storage units, chairs, desks, or cabinets, required for use in the retail project and purchased as freestanding or modular units, regardless of where the assembly takes place. It excludes casework and built-in millwork items, which must be part of the base building calculations.

Furniture, fixtures, and equipment are all items that are not base-building elements. Examples include lamps, electronics, desks, chairs, and tables.

Geothermal energy is electricity generated by harnessing hot water or steam from within the earth.

Geothermal heating systems use pipes to transfer heat from underground steam or hot water for heating, cooling, and hot water. The system retrieves heat during cool months and returns heat in summer months.

Glare is any excessively bright source of light within the visual field that creates discomfort or loss in visibility.

Graywater is defined by the Uniform Plumbing Code (UPC) in its Appendix G, Gray Water Systems for Single-Family Dwellings, as "untreated household waste water which has not come into contact with toilet waste. Greywater includes used water from bathtubs, showers, bathroom wash basins, and water from clothes-washer and laundry tubs. It must not include waste water from kitchen sinks or dishwashers." The International Plumbing Code (IPC) defines graywater in its Appendix C, Gray Water Recycling Systems, as "waste water discharged from lavatories, bathtubs, showers, clothes washers and laundry sinks." Some states and local authorities allow kitchen sink wastewater to be included in graywater. Other differences with the UPC and IPC definitions can likely be found in state and local codes. Project teams should comply with graywater definitions as established by the authority having jurisdiction in the project area.

Green cleaning is the use of cleaning products and practices that have lower environmental impacts than conventional products and practices.

Green power is synonymous with **renewable energy.**

Green-e is a program established by the Center for Resource Solutions to both promote green electricity products and provide consumers with a rigorous and nationally recognized method to identify those products.

Greenfields are sites not previously developed or graded that could support open space, habitat, or agriculture.

Greenhouse gases (GHGs) absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by Earth's surface, clouds, and the atmosphere itself. Increased concentrations of greenhouse gases are a root cause of global climate change.

Group (shared) multioccupant spaces include conference rooms, classrooms, and other indoor spaces used as a place of congregation.

Halons are substances, used in fire-suppression systems and fire extinguishers, that deplete the stratospheric ozone layer.

GLOSSARY

Hardscape consists of the inanimate elements of the building landscaping. Examples include pavement, roadways, stone walls, concrete paths and sidewalks, and concrete, brick, and tile patios.

Hard surface flooring includes vinyl, linoleum, laminate flooring, wood flooring, rubber flooring, wall base, and associated sundries.

Heat island effect refers to the absorption of heat by hardscapes, such as dark, nonreflective pavement and buildings, and its radiation to surrounding areas. Particularly in urban areas, other sources may include vehicle exhaust, air-conditioners, and street equipment; reduced airflow from tall buildings and narrow streets exacerbates the effect.

Horizontal footcandles occur on a horizontal surface. They can be added together arithmetically when more than 1 source provides light to the same surface.

HVAC systems are equipment, distribution systems, and terminals that provide the processes of heating, ventilating, or air-conditioning. (ASHRAE 90.1–2007)

Hybrid vehicles use a gasoline engine to drive an electric generator and use the electric generator and/or storage batteries to power electric motors that drive the vehicle's wheels.

Hydro energy is electricity produced from the downhill flow of water from rivers or lakes.

Hydrochlorofluorocarbons (HCFCs) are refrigerants that cause significantly less depletion of the stratospheric ozone layer than chlorofluorocarbons.

Hydrofluorocarbons (HFCs) are refrigerants that do not deplete the stratospheric ozone layer but may have high global warming potential. HFCs are not considered environmentally benign.

Hydrology is the study of water occurrence, distribution, movement, and balances in an ecosystem.

Hydropower is electricity produced from the downhill flow of water from rivers or lakes.

Impervious surfaces have a perviousness of less than 50% and promote runoff of water instead of infiltration into the subsurface. Examples include parking lots, roads, sidewalks, and plazas.

An **incinerator** is a furnace or container for burning waste materials.

Individual occupant spaces are standard workstations where workers conduct individual tasks.

Indoor adhesive, sealant, or **sealant primer** product is an adhesive or sealant product applied on-site, inside the building's weatherproofing system.

Indoor air quality (IAQ) is the nature of air inside the space that affects the health and well-being of building occupants. It is considered acceptable when there are no known contaminants at harmful concentrations and a substantial majority (80% or more) of the occupants do not express dissatisfaction. (ASHRAE 62.1–2007)

Indoor carpet systems are carpet, carpet adhesive, or carpet cushion products installed on-site inside the building's weatherproofing system.

Indoor composite wood or **agrifiber is a** product installed inside the building's weatherproofing system.

Indoor paints or **coating products** are applied inside a building's weatherproofing system.

Infiltration is uncontrolled air leakage into conditioned spaces through unintentional openings in ceilings, floors, and walls from unconditioned spaces or the outdoors. (ASHRAE 62.1–2007)

Infiltration basins and trenches are devices used to encourage subsurface infiltration of runoff volumes through temporary surface storage. Basins are ponds that can store large volumes of stormwater. They need to drain within 72 hours to maintain aerobic conditions and be available for future storm events. Trenches are similar to infiltration basins but are shallower and function as a subsurface reservoir for stormwater volumes. Pretreatment to remove sediment and oil may be necessary to avoid clogging infiltration devices. Infiltration trenches are more common in areas where infiltration basins are not possible.

Infrared (or thermal) emittance is a parameter between 0 and 1 (or 0% and 100%) that indicates the ability of a material to shed infrared radiation (heat). The wavelength range for this radiant energy is roughly 5 to 40 micrometers. Most building materials (including glass) are opaque in this part of the spectrum and have an emittance of roughly 0.9. Materials such as clean, bare metals are the most important exceptions to the 0.9 rule. Thus clean, untarnished galvanized steel has low emittance, and aluminum roof coatings have intermediate emittance levels.

GLOSSARY

In situ remediation involves treatment of contaminants using technologies such as injection wells or reactive trenches. These methods employ the natural hydraulic gradient of groundwater and usually require only minimal disturbance of the site.

An **installation inspection** examines components of the building systems to determine whether they are installed properly and ready for systems performance testing.

Insulation inhibits the transfer of heat. It is typically installed on the walls, roof, and floor to decrease the need for heating and cooling.

Integrated pest management (IPM) is the coordinated use of knowledge about pests, the environment, and pest prevention and control methods to minimize pest infestation and damage by the most economical means while minimizing hazards to people, property, and the environment.

Interior lighting power allowance is the maximum lighting power (in watts) allowed for the interior of a building.

Interior nonstructural components reuse is determined by dividing the area of retained components by the larger of (1) the area of the prior condition or (2) the area of the completed design.

Internally illuminated exterior retail signage is outdoor advertising or directional signage whose luminous elements (lamps, etc.) are inside the sign; light is emitted through the sign's translucent portions. For LEED, such signage is exempt from credit requirements but must then be equipped with a control device independent of any nonexempt lighting.

Invasive plants are nonnative to the ecosystem and likely to cause harm once introduced. These species are characteristically adaptable and aggressive, have a high reproductive capacity, and tend to overrun the ecosystems they enter. Collectively, they are among the greatest threats to biodiversity and ecosystem stability.

Laminate adhesive is used in wood or agrifiber products, such as veneered panels, composite wood products contained in engineered lumber, and door assemblies.

Lamps use electricity to produce light in any of several ways: by heating a wire for incandescence; by exciting a gas that produces ultraviolet light from a luminescent material; by generating an arc that emits visible light and some ultraviolet light; or by inducing excitation of mercury through radio frequencies. Light-emitting diodes packaged as traditional lamps also meet this definition.

Lamp life is the useful operating life of the sources of artificial light, such as bulbs.

A **land trust** is a nonprofit organization that works to conserve land by undertaking or assisting in land or easement acquisitions, or by engaging in the stewardship of such land or easements.

Landfills are waste disposal sites for solid waste from human activities.

The **landscape area** is the total site area less the building footprint, paved surfaces, water bodies, and patios.

The **landscape coefficient (K_L)** is a constant used to calculate the evapotranspiration rate. It takes into account the species factor, density factor, and microclimate factor of the area.

The **leakage rate** is the speed at which an appliance loses refrigerant, measured between refrigerant charges or over 12 months, whichever is shorter. The leakage rate is expressed in terms of the percentage of the appliance's full charge that would be lost over a 12-month period if the rate stabilized. (EPA Clean Air Act, Title VI, Rule 608)

A **least toxic chemical pesticide** is any pesticide product for which all active ingredients and known inert ingredients meet the least toxic Tier 3 hazard criteria under the City and County of San Francisco's hazard screening protocol. Least toxic also applies to any pesticide product, other than rodent bait, that is applied in a self-contained, enclosed bait station placed in an inaccessible location or applied in a gel that is neither visible nor accessible.

The **LEED project boundary** is the portion of the project site submitted for LEED certification. For single building developments, this is the entire project scope and is generally limited to the site boundary. For multiple building developments, the LEED project boundary may be a portion of the development as determined by the project team.

Legionella pneumophila is a waterborne bacterium that causes Legionnaire's disease. It grows in slow-moving or still warm water and can be found in plumbing, showerheads, and water storage tanks. Outbreaks of Legionella pneumonia have been attributed to evaporative condensers and cooling towers.

GLOSSARY

Life-cycle assessment is an analysis of the environmental aspects and potential impacts associated with a product, process, or service.

Life-cycle costing is an accounting methodology used to evaluate the economic performance of a product or system over its useful life. It considers operating costs, maintenance expenses, and other economic factors.

Light pollution is waste light from building sites that produces glare, is directed upward to the sky, or is directed off the site. Waste light does not increase nighttime safety, utility, or security and needlessly consumes energy.

Light trespass is obtrusive light that is unwanted because of quantitative, directional, or spectral attributes. Light trespass can cause annoyance, discomfort, distraction, or loss of visibility.

Lighting power density is the installed lighting power, per unit area.

Local zoning requirements are local government regulations imposed to promote orderly development of private lands and prevent land-use conflicts.

Lockable changing areas and **showers** are intended for employees. Lockable restrooms or bathroom stalls may be used for changing areas as long as they are spacious enough to allow changing comfortably. Lockable changing areas and showers must be located within 200 yards of a building entrance.

Low-emitting vehicles are classified as zero-emission vehicles (ZEVs) by the California Air Resources Board.

A **lumen** is a unit of luminous flux equal to the light emitted in a unit solid angle by a uniform point source of 1 candle intensity.

A l**uminaire** is a complete lighting unit consisting of a lamp (or lamps) with the housing designed to distribute the light, position, and protect the lamp and connect it to the power supply.

Luminous opening refers to the part of the outer surface of a luminaire (lighting fixture) through which light is emitted (i.e., the opening where the lamps are).

Makeup water is fed into a cooling tower system to replace water lost through evaporation, drift, bleed-off, or other causes.

Management staff includes employees or contractors involved in operating and maintaining a project building and site.

Marine Stewardship Council Blue Eco-Label applies to products that meet certain principles and criteria for sustainable fishing, including sustainable harvest of the target stock, acceptable impact of the fishery on the ecosystem, effectiveness of the fishery management system (including all relevant biological, technological, economic, social, environmental, and commercial aspects), and compliance with relevant laws and standards.

Market value, presumed to be less than replacement value, is the amount that either was paid or would have been paid for a used product.

Mass transit is designed to transport large groups of persons in a single vehicle, such as a bus or train.

Material safety data sheets (MSDS) are detailed, written instructions documenting a method to achieve uniformity of performance.

Mechanical ventilation, or **active ventilation**, is provided by mechanically powered equipment, such as motor-driven fans and blowers, but not by devices such as wind-driven turbine ventilators and mechanically operated windows. (ASHRAE 62.1–2004)

Metering controls limit the flow time of water. They are generally manual-on and automatic-off devices, most commonly installed on lavatory faucets and showers.

Microclimate factor (k_{mc}) is a constant used in calculating the landscape coefficient. It adjusts the evapotranspiration rate to reflect the climate of the immediate area.

Microirrigation involves irrigation systems with small sprinklers and microjets or drippers designed to apply small volumes of water. The sprinklers and microjets are installed within a few centimeters of the ground; drippers are laid on or below grade.

Minimum efficiency reporting value (MERV) is a filter rating established by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE 52.2–1999, Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size). MERV categories range from 1 (very low efficiency) to 16 (very high).

GLOSSARY

Mixed-mode ventilation combines mechanical and natural ventilation methods.

A **mixed-use** project involves a combination of residential and commercial or retail components.

A **multitenant complex** is a master-planned development of stores, restaurants, and other businesses; retailers may share one or more services and/or common areas.

The **National Pollutant Discharge Elimination System (NPDES)** is a permit program that controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.

Native (or indigenous) plants are adapted to a given area during a defined time period and are not invasive. In North America, the term often refers to plants growing in a region prior to the time of settlement by people of European descent.

Natural areas feature native or adapted vegetation or other ecologically appropriate features.

Natural ventilation, or **passive ventilation**, is provided by thermal, wind, or diffusion effects through doors, windows, or other intentional openings in the building; it uses the building layout, fabric, and form to achieve heat transfer and air movement.

Neighborhood is synonymous with **residential area.**

Net metering is a metering and billing arrangement that allows on-site generators to send excess electricity flows to the regional power grid. These electricity flows offset a portion of those drawn from the grid.

Net project material value includes the construction material value and the CSI Division 12 (Furniture and Furnishings) material value, the lesser of material values for mechanical and electric components, and the salvage value identified in the MR credits.

Nonoccupied spaces include all rooms used by maintenance personnel that are not open for use by occupants. Examples are closets and janitorial, storage, and equipment rooms.

Nonporous sealant is a substance used as a sealant on nonporous materials. Nonporous materials, such as plastic and metal, do not have openings in which fluids may be absorbed or discharged.

Nonpotable water. See **potable water.**

Nonwater (or composting) toilet systems are dry plumbing fixtures and fittings that contain and treat human waste via microbiological processes.

A **nonwater (or dry) urinal** replaces a water flush with a trap containing a layer of buoyant liquid that floats above the urine, blocking sewer gas and odors.

Occasional furniture is located in lobbies and in conference rooms.

Occupants in a commercial building are workers who either have a permanent office or workstation in the building or typically spend a minimum of 10 hours per week in the building. In a residential building, occupants also include all persons who live in the building.

Off-gassing is the emission of volatile organic compounds (VOCs) from synthetic and natural products.

Off-site renewable energy is derived from renewable energy sources and generated outside the project site perimeter; it is delivered through a private agreement with the energy-generating entity.

Off-site salvaged materials are recovered from a source different from the project site.

On-demand (or tankless) heaters heat water only when it is needed and then apply only the amount of heat required to satisfy the immediate need.

Ongoing commissioning is a continuous process that methodically identifies and corrects system problems to maintain optimal building performance; it includes regular measurement and comparative analysis of building energy data over time.

Ongoing consumables have a low cost per unit and are regularly used and replaced in the course of business. Examples include paper, toner cartridges, binders, batteries, and desk accessories.

On-site renewable energy is energy derived from renewable sources located within the project site perimeter.

On-site salvaged materials are recovered from and reused at the same building site.

On-site wastewater treatment is the transport, storage, treatment, and disposal of wastewater generated on the project site.

GLOSSARY

Open space area is usually defined by local zoning requirements. If local zoning requirements do not clearly define open space, it is defined for the purposes of LEED calculations as the property area minus the development footprint; it must be vegetated and pervious, with exceptions only as noted in the credit requirements section. Only ground areas are calculated as open space. For projects located in urban areas that earn a Development Density and Community Connectivity credit, open space also includes nonvehicular, pedestrian-oriented hardscape spaces.

Open-grid pavement is less than 50% impervious and accommodates vegetation in the open cells.

Outdoor air is the ambient air that enters a building through a ventilation system, either through natural ventilation or by infiltration. (ASHRAE 62.1–2007)

The **owner** is the person directly employed by the organization holding title to the project building and recognized by law as having rights, responsibilities, and ultimate control over the building.

Owner's project requirements is a written document that details the ideas, concepts, and criteria that are determined by the owner to be important to the success of the project.

Ozone (O_3) is a gas composed of 3 oxygen atoms. It is not usually emitted directly into the air, but at ground-level it is created by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the presence of sunlight. Ozone has the same chemical structure whether it occurs in the atmosphere or at ground level and can have positive or negative effects, depending on its location. (U.S. Environmental Protection Agency)

Paint is a liquid, liquefiable, or mastic composition that is converted to a solid protective, decorative, or functional adherent film after application as a thin layer. These coatings are intended for application to interior or exterior surfaces of residential, commercial, institutional, or industrial buildings.

Parking footprint refers to the area of the project site occupied by the parking areas and structures.

Parking subsidies are the costs of providing occupant parking that are not recovered in parking fees.

In a **partially shielded** exterior light fixture, the lower edge of the shield is at or below the centerline of the lamp, to minimize light emitted above the horizontal plane.

Pedestrian access allows people to walk to services without being blocked by walls, freeways, or other barriers.

Percentage improvement measures the energy cost savings for the proposed building performance compared with the baseline building performance.

Permeable. See **porous pavement.**

Perviousness is the percentage of the surface area of a paving system that is open and allows moisture to soak into the ground below.

Phenol formaldehyde, which off-gasses only at high temperature, is used for exterior products, although many of these products are suitable for interior applications.

Photovoltaic (PV) energy is electricity from photovoltaic cells that convert the energy in sunlight into electricity.

A **picogram** is 1 trillionth of a gram.

Picograms per lumen-hour is a measure of the amount of mercury in a lamp per unit of light delivered over its useful life.

Plug load is synonymous with **receptacle load.**

Pollutants include emissions of carbon dioxide (CO2), sulfur dioxide (SO2), nitrogen oxides (NOx), mercury (Hg), small particulates (PM2.5), and large particulates (PM10).

Porous materials have tiny openings, often microscopic, that can absorb or discharge fluids. Examples include wood, fabric, paper, corrugated paperboard, and plastic foam. (SCAQMD Rule 1168)

Porous pavement and **permeable surfaces** allow runoff to infiltrate into the ground.

Postconsumer fiber consists of paper, paperboard, and fibrous wastes that are collected from municipal solid waste streams.

Postconsumer material is recycled from consumer waste.

GLOSSARY

Postconsumer recycled content is the percentage of material in a product that was consumer waste. The recycled material was generated by household, commercial, industrial, or institutional end-users and can no longer be used for its intended purpose. It includes returns of materials from the distribution chain. Examples include construction and demolition debris, materials collected through recycling programs, discarded products (e.g., furniture, cabinetry, decking), and landscaping waste (e.g., leaves, grass clippings, tree trimmings). (ISO 14021)

Potable water meets or exceeds EPA's drinking water quality standards and is approved for human consumption by the state or local authorities having jurisdiction; it may be supplied from wells or municipal water systems.

ppm stands for parts per million.

Preconsumer recycled content, formerly known as postindustrial content, is the percentage of material in a product that is recycled from manufacturing waste. Examples include planer shavings, sawdust, bagasse, walnut shells, culls, trimmed materials, overissue publications, and obsolete inventories. Excluded are rework, regrind, or scrap materials capable of being reclaimed within the same process that generated them. (ISO 14021)

Predicted mean vote is an empirical equation for predicting the mean vote on a rating scale of thermal comfort of a large population of people exposed to a certain environment.

Preferred parking, available to particular users, includes designated spaces close to the building (aside from designated handicapped spots), designated covered spaces, discounted parking passes, and guaranteed passes in a lottery system.

Preventive maintenance is routinely scheduled equipment inspection, cleaning, and repair conducted to detect and prevent equipment failure and keep materials and systems in working order.

Previously developed sites once had buildings, roadways, parking lots, or were graded or otherwise altered by direct human activities.

A **primer** is a material applied to a substrate to improve the adhesion of subsequently applied coats.

Prior condition area is the total area of finished ceilings, floors, and full-height walls that existed when the project area was selected. It does not include exterior windows and doors.

Prior condition is the state of the project space at the time it was selected.

Process energy is used by office and general miscellaneous equipment, computers, elevators and escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g., lighting integral to medical equipment), and other (e.g., waterfall pumps).

Process water is used for industrial processes and building systems such as cooling towers, boilers, and chillers. It can also refer to water used in operational processes, such as dishwashing, clothes washing, and ice making.

Property area is the total area within the legal property boundaries of a site; it encompasses all areas of the site, including constructed and nonconstructed areas.

Proposed building performance is the annual energy cost calculated for a proposed design, as defined in ANSI/ASHRAE/IESNA Standard 90.1–2007, Appendix G.

Protected Harvest certification standards reflect the growing requirements and environmental considerations of different crops and bioregions. Each crop- and region-specific standard addresses production, toxicity, and chain-of-custody.

Public transportation consists of bus, rail, or other transit services for the general public that operate on a regular, continual basis.

Rainforest Alliance certification is awarded to farms that protect wildlife by planting trees, control erosion, limit agrochemicals, protect native vegetation, hire local workers, and pay fair wages.

Rapidly renewable materials are agricultural products, both fiber and animal, that take 10 years or less to grow or raise and can be harvested in a sustainable fashion.

Rated power is the nameplate power on a piece of equipment. It represents the capacity of the unit and is the maximum that it will draw.

Receptacle (or plug) load is the current drawn by all equipment that is plugged into the electrical system.

GLOSSARY

Recirculated air is removed from a space and reused as supply air, delivered by mechanical or natural ventilation.

Reclaimed water is wastewater that has been treated and purified for reuse.

Recommissioning applies to buildings that were previously commissioned as part of new construction or buildings covered by existing building commissioning.

Recovered fiber includes both postconsumer fiber and waste fiber from the manufacturing process.

Recycled content is the proportion, by mass, of preconsumer or postconsumer recycled material in a product. (ISO 14021)

Recycling is the collection, reprocessing, marketing, and use of materials that were diverted or recovered from the solid waste stream.

A r**ecycling collection area** is located in regularly occupied space in the building for the collection of occupants' recyclables. A building may have numerous collection areas from which recyclable materials are typically removed to a central collection and storage area.

Reflectance is the percentage of light energy that is not absorbed when light falls on the surface. A white surface has a higher reflectance than an otherwise identical black surface.

Refrigerants are the working fluids of refrigeration cycles that absorb heat from a reservoir at low temperatures and reject heat at higher temperatures.

Refurbished materials are products that could have been disposed of as solid waste. These products have completed their life cycle as consumer items and are then refurbished for reuse without substantial alteration of their form. Refurbishing includes renovating, repairing, restoring, or generally improving the appearance, performance, quality, functionality, or value of a product.

Regionally extracted materials are raw materials taken from within a 500-mile radius of the project site.

Regionally manufactured materials are assembled as finished products within a 500-mile radius of the project site. Assembly does not include on-site assembly, erection, or installation of finished components.

Regularly occupied spaces are areas where workers are seated or standing as they work inside a building. In a retail space this includes the sales floor, transaction counters, sales desks, workstations, offices, conference rooms, food-prep areas, cooking areas, and other areas of administrative support.

Relative humidity is the ratio of partial density of airborne water vapor to the saturation density of water vapor at the same temperature and total pressure.

Remanufactured materials are items that are made into other products. One example is concrete that is crushed and used as subbase.

Remediation is the process of cleaning up a contaminated site by physical, chemical, or biological means. Remediation processes are typically applied to contaminated soil and groundwater.

Renewable energy comes from sources that are not depleted by use. Examples include energy from the sun, wind, and small (low-impact) hydropower, plus geothermal energy and wave and tidal systems. Ways to capture energy from the sun include photovoltaic, solar thermal, and bioenergy systems based on wood waste, agricultural crops or residue, animal and other organic waste, or landfill gas.

Renewable energy certificates (RECs) are tradable commodities representing proof that a unit of electricity was generated from a renewable energy resource. RECs are sold separately from electricity itself and thus allow the purchase of green power by a user of conventionally generated electricity.

Replacement value is the estimated cost of replacing a used product. This value may be equal to the cost of a similar new product or based on a new product with comparable features.

A **residential area** is land zoned primarily for housing at a density of 10 units per acre or greater. These areas may have single-family and multifamily housing and include building types such as townhomes, apartments, duplexes, condominiums, or mobile homes.

The **Resource Conservation and Recovery Act (RCRA)** addresses active and future facilities and was enacted in 1976 to give EPA authority to control hazardous wastes from cradle to grave, including generation, transportation, treatment, storage, and disposal. Some nonhazardous wastes are also covered under RCRA.

GLOSSARY

Retained components are portions of the finished ceilings, finished floors, full-height walls and demountable partitions, interior doors, and built-in case goods that existed in the prior condition area and remain in the completed design.

Retention ponds capture stormwater runoff and clear it of pollutants before its release. Some retention pond designs use gravity only; others use mechanical equipment, such as pipes and pumps, to facilitate transport. Some ponds are dry except during storm events; others permanently store water.

A **retrofit** is any change to an existing facility, such as the addition or removal of equipment or an adjustment, connection, or disconnection of equipment.

Return air is removed from a space and then recirculated or exhausted. (ASHRAE 62.1–2007)

Reuse returns materials to active use in the same or a related capacity as their original use, thus extending the lifetime of materials that would otherwise be discarded. Examples of construction materials that can be reused include extra insulation, drywall, and paints.

Reused area is the total area of the building structure, core, and envelope that existed in the prior condition and remains in the completed design.

Ridesharing is synonymous with carpooling.

Safety and comfort light levels meet local code requirements and must be adequate to provide a safe path for egress without overlighting the area.

Salvaged materials or **reused materials** are construction materials recovered from existing buildings or construction sites and reused. Common salvaged materials include structural beams and posts, flooring, doors, cabinetry, brick, and decorative items.

A **sealant** has adhesive properties and is formulated primarily to fill, seal, or waterproof gaps or joints between 2 surfaces. Sealants include sealant primers and caulks. (SCAQMD Rule 1168)

A **sealant primer** is applied to a substrate, prior to the application of a sealant, to enhance the bonding surface. (SCAQMD Rule 1168)

Seating consists of task and guest chairs used with systems furniture.

Secure bicycle storage is an internal or external space that keeps bicycles safe from theft. It may include lockers and storage rooms.

Sedimentation is the addition of soil particles to water bodies by natural and human-related activities. Sedimentation often decreases water quality and can accelerate the aging process of lakes, rivers, and streams.

Sensors are devices that undergo a measurable change in response to environmental changes and communicate this change to a control system.

Setpoints are normal operating ranges for building systems and indoor environmental quality. When the building systems are outside of their normal operating range, action is taken by the building operator or automation system.

Shielding is a nontechnical term that describes devices or techniques that are used as part of a luminaire or lamp to limit glare, light trespass, or sky glow.

Site area is synonymous with **property area.**

A **site assessment** is an evaluation of a site's aboveground and subsurface characteristics, including its structures, geology, and hydrology. Site assessments are typically used to determine whether contamination has occurred, as well as the extent and concentration of any release of pollutants. Information generated during a site assessment is used to make remedial action decisions.

Site energy is the amount of heat and electricity consumed by a building, as reflected in utility bills.

Sky glow is caused by stray light from unshielded light sources and light reflecting off surfaces that then enter the atmosphere and illuminate and reflect off dust, debris, and water vapor. Sky glow can substantially limit observation of the night sky, compromise astronomical research, and adversely affect nocturnal environments.

Soft costs are expense items that are not considered direct construction costs. Examples include architectural, engineering, financing, and legal fees.

GLOSSARY

Solar reflectance, or **albedo,** is a measure of the ability of a surface material to reflect sunlight—visible, infrared, and ultraviolet wavelengths—on a scale of 0 to 1. Solar reflectance is also called albedo. Black paint has a solar reflectance of 0; white paint (titanium dioxide) has a solar reflectance of 1.

Solar thermal systems collect or absorb sunlight via solar collectors to heat water that is then circulated to the building's hot water tank. Solar thermal systems can be used to warm swimming pools or heat water for residential and commercial use.

The **solar reflectance index (SRI)** is a measure of a material's ability to reject solar heat, as shown by a small temperature rise. Standard black (reflectance 0.05, emittance 0.90) is 0 and standard white (reflectance 0.80, emittance 0.90) is 100. For example, a standard black surface has a temperature rise of 90˚F (50˚C) in full sun, and a standard white surface has a temperature rise of 14.6˚F (8.1˚C). Once the maximum temperature rise of a given material has been computed, the SRI can be calculated by interpolating between the values for white and black. Materials with the highest SRI values are the coolest choices for paving. Because of the way SRI is defined, particularly hot materials can even take slightly negative values, and particularly cool materials can even exceed 100. (Lawrence Berkeley National Laboratory Cool Roofing Materials Database)

Source energy is the total amount of raw fuel required to operate a building; it incorporates all transmission, delivery, and production losses for a complete assessment of a building's energy use.

Source reduction reduces the amount of unnecessary material brought into a building. Examples include purchasing products with less packaging.

Species factor (k_s) is a constant used to adjust the evapotranspiration rate to reflect the biological features of a specific plant species.

The **square footage** of a building is the total area in square feet (sf) of all rooms, including corridors, elevators, stairwells, and shaft spaces.

Standard operating procedures are detailed, written instructions documenting a method to achieve uniformity of performance.

Stormwater runoff consists of water from precipitation that flows over surfaces into sewer systems or receiving water bodies. All precipitation that leaves project site boundaries on the surface is considered stormwater runoff.

A **stormwater pollution prevention plan** describes all measures to prevent stormwater contamination, control sedimentation and erosion during construction, and comply with the requirements of the Clean Water Act.

Stratified random sampling categorizes members of a population into discrete subgroups, based on characteristics that may affect their responses to a survey. For example, a survey of building occupants' commuting behavior might separate people by income level and commuting distance. To yield representative results, the survey should sample subgroups according to their proportions in the total population.

Submetering is used to determine the proportion of energy use within a building attributable to specific end uses or subsystems (e.g., the heating subsystem of an HVAC system).

Supply air is delivered by mechanical or natural ventilation to a space, composed of any combination of outdoor air, recirculated air, or transfer air. (ASHRAE 62.1–2007)

Sustainable forestry is the practice of managing forest resources to meet the long-term forest product needs of humans while maintaining the biodiversity of forested landscapes. The primary goal is to restore, enhance, and sustain a full range of forest values, including economic, social, and ecological considerations.

A **sustainable purchasing policy** gives preference to products that have little to no negative impact on the environment and society throughout their life cycle, and to the companies that supply them.

A **sustainable purchasing program** is the development, adoption, and implementation of a procurement strategy that supports an organization's sustainable purchasing policy.

Systematic sampling surveys every xth person in a population, using a constant skip interval. It relies on random sampling order or an order with no direct relationship to the variable under analysis (e.g., alphabetical order when sampling for commuting behavior).

Systems furniture includes panel-based workstations comprising modular interconnecting panels, hang-on components, and drawer and filing components or a free-standing grouping of furniture items designed to work in concert.

GLOSSARY

Systems performance testing is the process of determining the ability of commissioned systems to perform in accordance with the owner's project requirements, the basis of design, and construction documents.

Telecommuting is working by using telecommunications and computer technology from a location other than the usual or traditional place of business—for example, from home, a satellite office, or a telework center.

A **tenant** is a person or entity that pays to occupy land or space that is owned by someone else.

Tertiary treatment is the highest form of wastewater treatment and includes removal of organics, solids, and nutrients as well as biological or chemical polishing, generally to effluent limits of 10 mg/L biological oxygen demand (BOD) 5 and 10 mg/L total suspended solids (TSS).

Thermal comfort exists when occupants express satisfaction with the thermal environment.

Tipping fees are charged by a landfill for disposal of waste, typically quoted per ton.

Total phosphorus (TP) consists of organically bound phosphates, polyphosphates, and orthophosphates in stormwater, the majority of which originates from fertilizer application. Chemical precipitation is the typical removal mechanism for phosphorus.

Total suspended solids (TSS) are particles that are too small or light to be removed from stormwater via gravity settling. Suspended solid concentrations are typically removed via filtration.

Transient users are occupants who do not use a facility on a consistent, regular, daily basis. Examples include students in higher education settings, customers in retail settings, and visitors in institutional settings.

Transit pass subsidies include reimbursement for employees' alternative transportation rides or passes purchased by the employer. In LEED, the subsidy must be at least 20% of the full fare.

A **transportation management plan** is a comprehensive strategy to reduce transportation impacts associated with automobile use to and from the LEED project.

A 2-year, 24-hour design storm is a nationally accepted rate that represents the largest amount of rainfall expected over a 24-hour period during a 2-year interval. The rate is the basis for planning and designing stormwater management facilities and features.

Undercover parking is underground or under a deck, roof, or building; its hardscape surfaces are shaded.

Universal notification means notifying building occupants not less than 72 hours before a pesticide is applied in a building or on surrounding grounds under normal conditions, and within 24 hours after application of a pesticide in emergency conditions. Use of a least toxic pesticide or self-contained nonrodent bait does not require universal notification; all other pesticide applications do.

Upstream equipment consists of all heating or cooling systems, equipment, and controls that are associated with a district energy system but are not part of the project building's thermal connection or do not interface with the district energy system. It includes the central energy plant and all transmission and distribution equipment associated with transporting the thermal energy to the project building and site.

Urea formaldehyde is a combination of urea and formaldehyde that is used in some glues and may emit formaldehyde at room temperature.

USDA Organic is the U.S. Department of Agriculture's certification for products that contain at least 95% organically produced ingredients (excluding water and salt). Any remaining ingredients must consist of approved nonagricultural substances (as listed by USDA) or be nonorganically produced agricultural products that are not commercially available in organic form.

The **U-value** describes how well a building element conducts heat. It measures the rate of heat transfer through a building element over a given area, under standardized conditions. The greater the U-value, the less efficient the building element is as an insulator. *The inverse of (1 divided by) the U-value is the R-value.*

Vegetation-containing artifices are planters, gardens, or other constructs intended to host flora.

A **vendor** of certified wood is the company that supplies wood products to contractors or subcontractors for on-site installation. A vendor needs a chain-of-custody number if it is selling FSC-certified products that are not individually labeled; this includes most lumber.

Ventilation is the process of supplying air to or removing air from a space for the purpose of controlling air contaminant levels, humidity, or temperature within the space. (ASHRAE 62.1-2007).

GLOSSARY

Verification is the range of checks and tests carried out to determine whether components, subsystems, systems, and interfaces between systems operate in accordance with the contract documents.

Vertical footcandles occur on a vertical surface. They can be added together arithmetically when more than 1 source provides light to the same surface.

Visible light transmittance (VLT) (T_{vis}) is the ratio of total transmitted light to total incident light (i.e., the amount of visible spectrum, 380–780 nanometers of light passing through a glazing surface divided by the amount of light striking the glazing surface). The higher the T_{vis} value, the more incident light passes through the glazing.

Vision glazing is the portion of an exterior window between 30 and 90 inches above the floor that permits a view to the outside.

Volatile organic compounds (VOCs) are carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vaporize (become a gas) at normal room temperatures.

Walking distance is the length of the walkable pathway between the building and public transportation.

Walk-off mats are placed inside building entrances to capture dirt, water, and other materials tracked inside by people and equipment.

Waste comprises all materials that flow from the building to final disposal. Examples include paper, grass trimmings, food scraps, and plastics. In LEED, waste refers to all materials that are capable of being diverted from the building's waste stream through waste reduction.

Waste disposal eliminates waste by means of burial in a landfill, combustion in an incinerator, dumping at sea, or any other way that is not recycling or reuse.

Waste diversion is a management activity that disposes of waste other than through incineration or the use of landfills. Examples include reuse and recycling.

Waste reduction includes both source reduction and waste diversion through reuse or recycling.

A **waste reduction program** encompasses source reduction, reuse, and recycling. Such a program assigns responsibility within the organization for implementation, lists the general actions that will be taken to reduce waste, and describes tracking and review procedures to monitor waste reduction and improve performance.

The **waste stream** is the overall flow of waste from the building to a landfill, incinerator, or other disposal site.

Wastewater is the spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter. (Federal Remediation Technologies Roundtable)

Waterless urinals are dry plumbing fixtures that use advanced hydraulic design and a buoyant fluid to maintain sanitary conditions.

A **water meter** measures the volume of water usage. Most commercial building water meters are designed to measure cold potable water.

Wave and tidal power systems capture energy from waves and the diurnal flux of tidal power, respectively. The captured energy is commonly used for desalination, water pumping, and electricity generation.

Wind energy is electricity generated by wind turbines.

Window-to-floor ratio (WFR) is the total area of the window (measured vertically from 30 inches above the finished floor to the top of the glass, multiplied by the width of the glass) divided by the floor area.

Xeriscaping is a landscaping method that makes routine irrigation unnecessary. It uses drought-adaptable and low-water plants as well as soil amendments such as compost and mulches to reduce evaporation.

ADDITIONAL INFORMATION

CONTACT INFORMATION

For all USGBC customer service inquiries, please call (US) 1-800-795-1747 or (outside US) 202-742-3792.

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ADDITIONAL INFORMATION

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- using real-world examples, scenarios, and case studies

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Learn while saving time and money:

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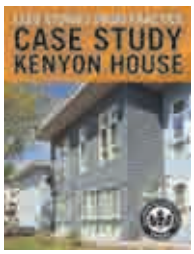
- with free podcasts (subscribe to USGBC's iTunes station!)

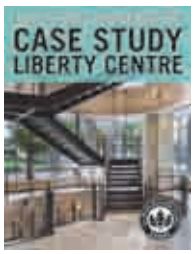
* If you're a member company, chapter, or higher education institution, help your constituents secure all LEED CMP needs through a webinar subscription.

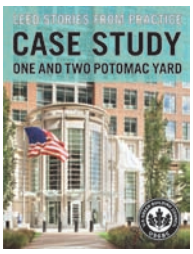
LEED Project Case Studies: Stories from Practice: *www.usgbc.org/casestudies*

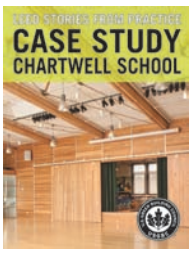
Learn from real project teams through:

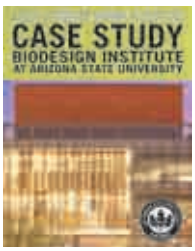
- lessons learned and best practices
- case study e-books or short articles











Looking to:

- Prepare for your LEED exam? *www.usgbc.org/credentials*

  Take advantage of USGBC's LEED Study Guides and Chapter study groups, and be sure to study all references listed in GBCI's Candidate Handbook.
- Maintain your LEED credentials? *www.usgbc.org/credential*s
- Save money through bulk purchases? *www.usgbc.org/elearning*, *www.usgbc.org/publications*
- License this workshop for your organization? *www.usgbc.org/education*

ADDITIONAL INFORMATION

PUBLICATIONS

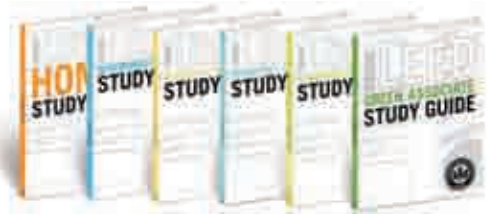
LEED Reference Guides: *www.usgbc.org/publications*

Whether working on a green building project, preparing for a LEED credentialing exam, or looking to expand your green building knowledge, these guides are essential resources. Based on the LEED rating systems, they provide the most thorough and comprehensive information available.

LEED Exam Prep Resources: *www.usgbc.org/publications*

USGBC's LEED exam study guides and other exam resources help you succeed in earning a LEED credential. They offer a variety of study tools, including review and practice questions. Choose from the following:

- LEED Green Associate Study Guide Combo (includes LEED Green Associate Study Guide and Green Building & LEED Core Concepts Guide)
- LEED AP with Specialty Study Guides for every credential: BD+C, ID+C, O+M, Homes, ND
- LEARN LEED: How-to Guide for Planning and Conducting LEED Study Groups



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These practical guides help green building professionals integrate LEED into their business practices by providing background, case examples, checklists, and tools.

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Chapter Membership: *www.usgbc.org/chapters*

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USGBC's Mission

To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life.

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APPENDIX 5: LEED ID+C 301 – IMPLEMENTATION PROCESS

Photo by Michael Myers

Green Interior Design & Construction:

The LEED Implementation Process

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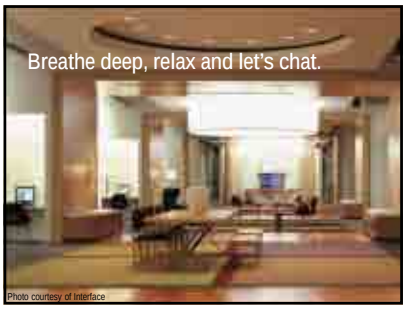

Photo courtesy of Interface

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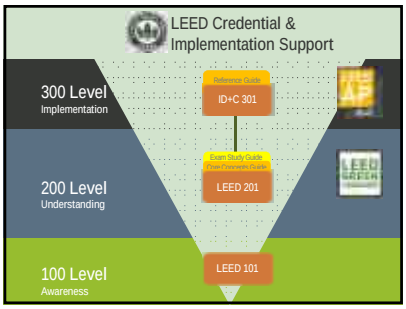
Learning Objectives

- Explain unique aspects of the LEED 2009 for Commercial Interiors Rating System.
- Recognize key green decisions throughout the LEED 2009 for Commercial Interiors process.
- Implement the LEED 2009 for Commercial Interiors process on interior fit-up projects.
- Apply integrative approach with project stakeholders.

LEED Credential & Implementation Support



LEED Credentials

Agenda

Introduction
Review of LEED 2009 for CI Rating System
LEED 2009 for CI Process
Phase 1: Site/Building Evaluation & Selection Point 1
Break
Phase 1: Site/Building Evaluation & Selection Point 2
Phase 2: Concept Design
Lunch
Phase 3: Schematic Design / Design Development
Phase 4: Contract Documents / Procurement
Break
Phase 5: Contract Administration
Phase 6: Close-Out / Post-Occupancy
Summary

Photo courtesy of Vancouver Port Authority

Overview of LEED 2009 for Commercial Interiors Rating System

Implementing the ID+C Rating System

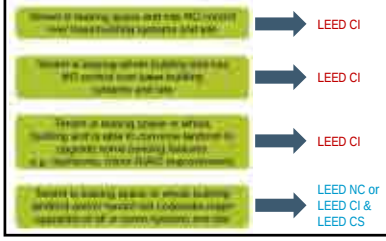
LEED Addresses…

GREEN BUILDING DESIGN & CONSTRUCTION	LEED FOR NEW CONSTRUCTION
	LEED FOR CORE & SHELL
	LEED FOR SCHOOLS
	LEED FOR HEALTHCARE
	LEED FOR RETAIL
GREEN INTERIOR DESIGN & CONSTRUCTION	LEED FOR COMMERCIAL INTERIORS
	LEED FOR RETAIL INTERIORS
GREEN BUILDING OPERATIONS & MAINTENANCE	LEED FOR EXISTING BUILDINGS
GREEN HOMES DESIGN & CONSTRUCTION	LEED FOR HOMES
GREEN NEIGHBORHOOD DEVELOPMENT	LEED FOR NEIGHBORHOOD DEVELOPMENT

LEED 2009 for Commercial Interiors Minimum Program Requirements

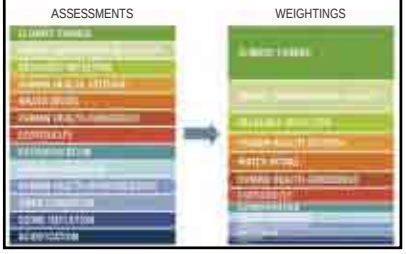
- Complies with applicable environmental laws
- Cannot be movable
- Reasonable project boundary
- Minimum 250 gross square feet (SF) and one (1) full-time equivalent (FTE)
- Complies with reasonable timetables and rating system sunset dates

Choosing the LEED 2009 for Commercial Interiors Rating System

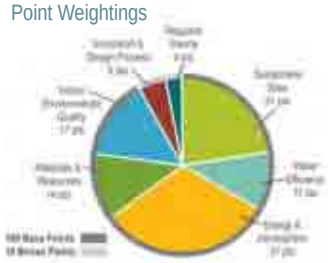


LEED 2009 for Commercial Interiors Credit Categories

Environmental Impacts



LEED 2009 for Commercial Interiors Point Weightings



LEED 2009 for Commercial Interiors: Unique Rating System Credits

- EAc1.1 - 1.4: Optimize Energy Performance
- MRc1.1: Tenant Space – Long-Term Commitment
- MRc3.2: Materials Reuse – Furniture and Furnishings
- MRc4-7: Must include furniture
- IEQc4.5: Low Emitting Materials – Systems Furniture and Seating

LEED 2009 for Commercial Interiors: Major Changes from v2.0

- WEp1 Water Efficiency
  - 20% Reduction
- EAp2 Minimum Energy Performance
  - 10% Lighting Power Reduction
  - 50% Energy Star Equipment
- EAc1.2 Optimize Energy Performance – Lighting Controls
  - Daylight controls for 50% of lighting load
  - Occupancy sensors for 75% of lighting load

Certification Levels

Points Achievement Thresholds

40-49 50-59 60-79 80+

LEED Project Resources & Tools

- Rating System
- Reference Guide
- LEED Online
- *Green Office Guide: Integrating LEED® Into Your Leasing Process*
- *www.usgbc.org*
- *www.gbci.org*

Photo courtesy of Mike Rolland

LEED 2009 for Commercial Interiors Process

Implementing the ID+C Rating System

THINK ABOUT IT

How do interior fit-up projects differ from new construction projects?

LEED 2009 for Commercial Interiors Project Process

70% of significant decisions are made in the first **20%** of the project schedule.

Integrative Approach to Design

"Designing and building a space can be a complicated process. We **integrated** the LEED rating system as part of the project coordination process from the beginning in order to make decisions in a way that **positively affects** the space and the outcome for the client."

– Kelly Yeh, Project Principal, EDX

Photo Courtesy of Columbia Chase Chase Partnership

Phase 1: Site/Building Evaluation & Selection

Implementing the ID+C Rating System

Phase 1: Site/Building Evaluation & Selection

- Establish project requirements.
- Select real estate team.
- Determine selection criteria.
- Evaluate and select site.
- Negotiate lease.

45%

of LEED 2009 for CI credits are impacted by site and building selection.

"GOLD STAR" QUESTION

Which Indoor Environmental Quality credits are affected by the base building selection, and why?

Establish Project Requirements

- Tenant drivers and goals
- Project decision makers
- Rough Order of Magnitude (ROM) program
- Budget
- Schedule

Real Estate Selection Team

THINK ABOUT IT

What capabilities should a real estate selection team have for a LEED for Commercial Interiors project?

"You get the team on board early. You get the right team, and the surprises go away."

– Barry Warfield, Senior Project Manager, Herman Miller, Inc.

Evaluate & Select Site/Building

- Green RFI (Request for Information)/RFP (Request for Proposal)
- Site short list
- Walk-throughs with real estate selection team
- LEED analysis
- Test-fits
- Select site/building

Site/Building Selection Criteria

- Cost – How much?
- Area required – How big?
- Geography – Where?
- Base building – What infrastructure? What amenities? What image?

Site Selection Criteria Sample

- On one level, 20,000 usable square feet housing 40 FTEs
- Closed spaces: 70%, including offices and conference center with pre-function area; remainder is open office area
- Central business district or nearby sub-districts
- State of the art MEP systems, after-hours HVAC required
- Fifteen parking spaces
- About $30 to $40/rentable SF lease rate; $70/usable SF project fit-up budget; eight-year term
- Minimally, LEED Gold

Evaluate & Select Site/Building

- SSc1 Site Selection Option 1: Select LEED-certified Building (5 points) – New Construction, Core & Shell, Existing Building: Operations & Maintenance

  OR
- SSc1 Site Selection Option 2: Path 1–12 (5 points)

Photo courtesy of the John Buck Company

LEED Analysis & Test Fit

1st Choice

3rd Choice

2nd Choice

4th Choice

THINK ABOUT IT

What critical LEED for Commercial Interiors prerequisites need to be confirmed at the building evaluation and site selection phase?

Critical Prerequisites

- WEp1 Water Use Reduction
- EAp2 Minimum Energy Performance
- EAp3 Fundamental Refrigerant Management
- IEQp1 Minimum Indoor Air Quality Performance
- IEQp2 Environmental Tobacco Smoke (ETS) Control

Preliminary LEED CI Checklist

Building Questionnaire Example

Site Information

❑ Yes ❑ No Building was developed on a site either: documented by an ASTM E1903-97 Phase II Environmental Site Assessment
or
has been classified as a Brownfield by a local, state or federal government agency, with letter stating such status.

Excerpt from *Green Office Guide: Integrating LEED into Your Leasing Process*

WORKBOOK ACTIVITY (GROUP)

Activity 1:

Evaluate & Select Site/ Building Using LEED for Commercial Interiors

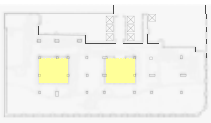
WORKBOOK ACTIVITY (GROUP)

Evaluate & Select Site/ Building Using LEED for Commercial Interiors

- Introductions.
- Review the Rough Order of Magnitude (ROM) program and the site options.
- Rank the sites from 1 to 5, with 1 being the best fit with project goals and 5 being the worst fit.
- Record findings in your participant workbook.

Site A: Adams Square Debrief

Site Aerial


Upper level floor plate

Exterior

Site B: Crystal Tower Debrief

Site Aerial

Upper Floor Plate

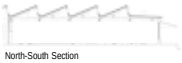
Exterior

Site C: Pilgrim Mill Debrief

Site Aerial

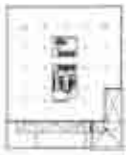
Ground Floor Plate

Exterior


North-South Section

Site D: Preston Building Debrief

Site Aerial


Upper Floor Plate

Exterior

Site E: The Centrum Debrief

Site Aerial

Upper Floor Plate

Exterior

Negotiate Lease

Define tenant/landlord relationship:

- Obligations of all parties
- Duration
- Fit-up allowance
- Base building modifications and upgrades
- Environmental objectives, including landlord offerings beyond LEED

Concept Design CD CA Close-Out

THINK ABOUT IT

What are the attributes of a green lease?

Green Lease Sample

Priority Parking [excerpt]

Landlord shall provide priority parking for carpools, van pools, low-emitting vehicles and fuel-efficient vehicles. As used in this paragraph, "low-emitting vehicles" and "fuel-efficient vehicles" are defined as vehicles that are either (i) classified as Zero Emission Vehicles (ZEV) by the California Air Resources Board, or (ii) have achieved a minimum green score of 40 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide.

Excerpt from *Green Office Guide: Integrating LEED into Your Leasing Process*

Concept Design CD CA Close-Out

Phase 1 Summary

- Determine LEED opportunities and constraints.
- Recognize evaluation and selection as sustainable design.
- Maximize leverage in tenant/ landlord relationship.

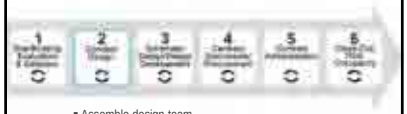
Photo courtesy of LPA, Inc.

Concept Design CD CA Close-Out

Phase 2: Concept Design

Implementing the ID+C Rating System

Phase 2: Concept Design



- Assemble design team.
- Conduct project start-up activities.
- Hold design charrette.
- Assign credits and prerequisites.
- Register project in LEED Online.

Design & Construction Team

Site Concept Design CD CA Close-Out

THINK ABOUT IT

For a LEED for Commercial Interiors project, how would you choose your:

- Architect and Interior Designer?
- MEP Engineer?
- General Contractor?

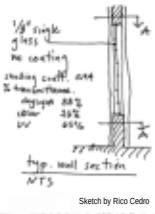
Design & Construction Team

- Core Design and Construction Team Members (LEED experience recommended)
  - Architect and Interior Designer
  - MEP Engineer
  - General Contractor
- Specialty Team Members
  - Commissioning Agent
  - Lighting/Daylighting Consultant
  - LEED Consultant
  - Energy Modeler
  - Civil Engineer/Landscape Architect

Site Concept Design CD CA Close-Out

Project Start-up Activities

- Base building drawings, specifications and construction regulations
- Base building and tenant systems interface
  - MEP
  - Envelope
  - Site
- Investigation of LEED opportunities with detailed program



Sketch by Rico Cedro

Site Concept Design CD CA Close-Out

SS c1 Site Selection Option 2 – Visible

- Path12: Other Quantifiable Environmental Performance: Maximize Open Space (LEED NC SSc5.2)
- Path12: Other Quantifiable Environmental Performance: Daylight 75% of Spaces (LEED CS IEQc8.1)

Photo by Rico Cedro

Site Concept Design CD CA Close-Out

SS c1 Option 2 – Not Visible

- Path 1: Brownfield Redevelopment
- Path12: Other Quantifiable Environmental Performance: Enhanced Refrigeration Management (LEED NC EAc4)

Site Concept Design CD CA Close-Out

35

points are impacted by lighting, HVAC and water systems.

"GOLD STAR" QUESTION

What is the energy breakdown of these systems in a typical office space?

HVAC: ___40_%

Lighting: ___30 %

Plug Loads: ___30 %

Strategies & Synergies

Site → Concept → Design → CD → CA → Close-Out

Strategies & Synergies

- Constraints
  - Solar orientation
  - Views
  - Envelope efficiency
  - Floor-to-floor height
- Opportunities
  - MEP systems
  - Spatial organization

Sketch by Rico Cedro

Site → Concept → Design → CD → CA → Close-Out

THINK ABOUT IT

What would you have on the agenda for your charrette?

Design Charrette

Preparation:

- Reports from key team members
- Base building opportunities/constraints
- Boundaries / FTE / square footage
- Project goals, scope, and budget
- Preliminary LEED scorecard

Choose a room that facilitates discussion and teamwork.

Site → Concept → Design → CD → CA → Close-Out

> "Gaining input from all parties — from leasing brokers to engineers to construction managers — was key in attaining our **near-platinum** certification."

/ Jennifer Ralph, CE Richard Ellis

WORKBOOK ACTIVITY (GROUP)

Activity 2: Understanding the Design Charrette

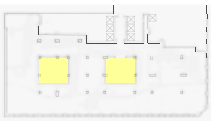
WORKBOOK ACTIVITY (GROUP)

Understanding the Design Charrette

- Review the background material.
- Conduct a mini-charrette looking for credit and strategy synergies.
- Record findings by completing the worksheet in your participant workbook.

Site A: Adams Square Debrief

Site Aerial



Upper level floor plate

Exterior

Site B: Crystal Tower Debrief

Site Aerial

Upper Floor Plate

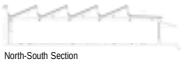
Exterior

Site C: Pilgrim Mill Debrief

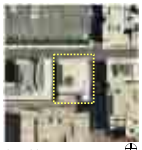
Site Aerial

Ground Floor Plate

Exterior


North-South Section

Site D: Preston Building Debrief


Site Aerial

Upper Floor Plate

Exterior

Site E: The Centrum Debrief

Site Aerial

Upper Floor Plate

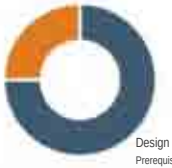
Exterior

THINK ABOUT IT

What are the key takeaways from the charrette?

Split Design/Construction Review

Construction
Prerequisites and credits



Design
Prerequisites and credits

Pros
- Increase certainty
- Timely documentation
- Issues identified early

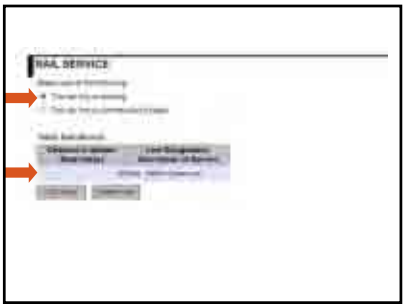
Cons
- Schedule
- Procurement process

Site | Concept | Design | CD | CA | Close-Out

Register Project in LEED Online

- Choose LEED Online Administrator.
- Assign credits and prerequisites.
- Document site and base building credits.

Site | Concept | Design | CD | CA | Close-Out



Phase 2 Summary

- Connection of LEED strategy to owner's goals
- Team with enhanced skills
- In-depth base building analysis
- Early decision making

Photo courtesy of HOK Architects Corporation

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Phase 3: Schematic Design/ Design Development

Implementing the ID+C Rating System

Photo courtesy of DPL Group

Phase 3: Schematic Design/ Design Development

- Integrate LEED goals into project schedule.
- Commission owner's project requirements.
- Develop lighting, HVAC, and plumbing alternatives.
- Integrate EAp2 minimum energy performance.
- Coordinate owner-supplied items.
- Evaluate material, product, and furniture reuse alternatives.
- Develop Innovation in Design credits.

Timing/Schedule Chart

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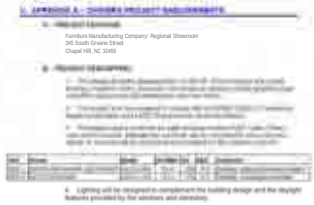
Commissioning: Owner's Project Requirements



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"GOLD STAR" QUESTION

What strategies and technologies may be outside the tenant's lease line but need to be included in LEED calculations?

Lighting, HVAC, Plumbing & Equipment/ Appliance Alternatives

Biggest areas of impact in tenant spaces for reduced operating expenses (energy/water):

- Lighting
- HVAC
- Plumbing
- Equipment and appliances

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Integrate Minimum Energy Performance Credits (EA p2)

EAp2 Documentation for:

- Lighting Power Density – 10%
- ENERGY STAR Qualified Equipment and Appliances – 50%

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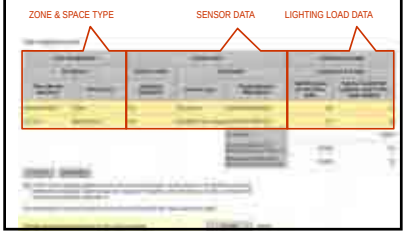
1. Lighting

A 2009 study found that creating **task specific** lighting solutions with updated ambient and task lights had an annual energy savings of approximately **200 million** kWh per year.

Lighting Control Form



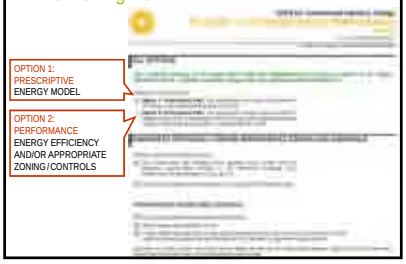
Lighting Control Drawing

Drawing courtesy of CB Richard Ellis

2. HVAC

For a large building portfolio owner, summer temperature adjustment and high performance filters yield an approximate energy savings of **30 million** kWh/year.

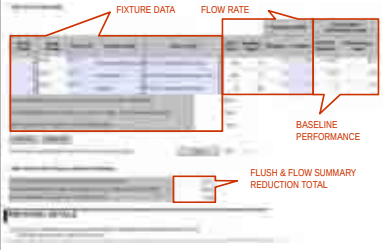
HVAC Zoning Form



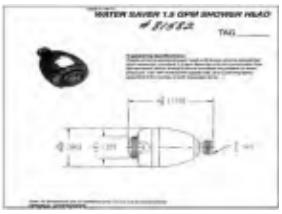
3. Plumbing

LEED Gold buildings used **54% less water** than the national average.

Water Use Reduction Form



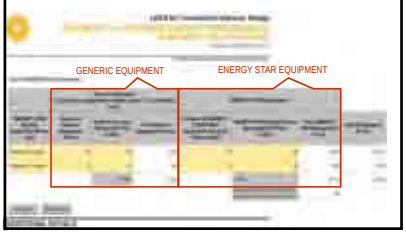
Water Use Reduction: Product Data Sheet



4. Equipment & Appliances

The replacement of 200,000 CRT computer monitors with flat screen LCDs will reduce energy usage by an estimated **39 million** kWh / year.

Equipment and Appliances Form



THINK ABOUT IT

What types of owner-supplied items are typically seen on tenant projects?

Coordinate Owner-Supplied Items & Services

- Focus: MRc4 - 7
- Coordination between contractor/owner
- One point of contact responsible for LEED credits
- Cost for materials only

Photo by Kevin Reeves

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GOLD STAR QUESTION

Does furniture, fittings, and equipment (FFE) need to be included in credits MRc3 - 7 and IEQc4? Would the same apply to LEED New Construction?

Identify & Evaluate Material & Furniture Reuse Opportunities

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Identify & Develop Innovation & Design Credits

Photo by: Ana Ka'ahanui

Site → Concept → Design → CD → CA → Close-Out

WORKBOOK ACTIVITY (GROUP)

Activity 3:

Materials Evaluation & Selection Strategies

WORKBOOK ACTIVITY (GROUP)

Materials Evaluation & Selection Strategies

- Review background materials.
- Discuss material selection.
- Record findings in your participant workbook.

Phase 3 Summary

- Schedule milestones
- Commission early integration
- Engineering decisions including documentation
- Strategies and technology choices related to LEED credits and other goals
- Owner-supplied items
- Innovation in Design decisions

Photo courtesy of Jerry Chevassus

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Phase 4: Contract Documents/ Procurement

Implementing the ID+C Rating System

Photo courtesy of Nusta Spa

Phase 4: Contract Documents & Procurement

- Integrate LEED into construction documents.
- Conduct procurement/buy-out.
- Enter design credit and prerequisites documentation into LEED Online (split submittal option).

Integrate LEED into Contract Documents

- Finalize material, product, furniture, and equipment selection.
- Finalize MEP design.
- Confirm design credits.
- Integrate LEED requirements into specifications and drawings.
- Conduct final commissioning document review.
- Review LEED Champion contract documents.

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"GOLD STAR" QUESTION

In project specifications, what are some of the most important LEED issues that need to be addressed?

Specification Example: Division 1

SECTION 10352
LEED REQUIREMENTS

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Specification Example: Product Section

SECTION 07920
JOINT SEALANTS

PART 1 – GENERAL

1. SUMMARY

B. Related Sections include the following:

1.3 SUBMITTALS

C. LEED Submittals:
1. Credit EQ 4.1: Manufacturers' product data for interior sealants, including printed statement of VOC content.

PART 2 – PRODUCTS

2.2 MATERIALS, GENERAL

B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits:

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Drawing Example

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Conduct Procurement/Buy-Out

- Identify LEED issues for pre-bid meeting.
- Determine impact of procurement method.
- Develop general contractor and critical sub-contactor short-list.
  - HVAC
  - Millworker
  - Finish trades

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LEED Online Narrative Strategies

- Strive for brevity and clarity.
- Address unique project conditions.
- Describe alternative compliance approaches.
- Coordinate with LEED Online forms and other documentation.

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Lighting Control Narrative

Each perimeter office will be illuminated by high, efficient recessed 2 x 4 troffer fixtures. These fixtures will be equipped with dimmable fluorescent ballasts by LightMaster*. Each fixture will be tied to a daylight sensor. These photosensors will be tied together, take an average of their respective readings, and dim the lights accordingly.

In addition, each office will have its own occupancy sensor. The lighting will be turned off when the office is unoccupied and dimmed per the photosensor when occupied. After sunset, the photosensors will be disengaged by means of a signal from a master controlstation. Each room will then have manual control over the illumination levels by means of a wall dimmer.

In the ninth-floor cafeteria, all of the perimeter lighting will have a fluorescent source and LightMaster* and Compact SE dimmable ballasts. The lighting fixtures will be controlled by occupancy sensors, (3) photo sensors, and will operate collectively.

*Brand names have been fictionalized for purpose of this educational program.

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Submit LEED Design Documents through LEED Online

- Preliminary review
- Response to preliminary review – clarifications

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WORKBOOK ACTIVITY (INDIVIDUAL)

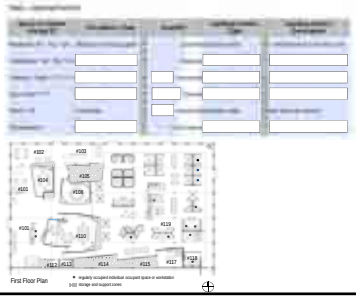
Activity 4:

Completing a LEED Online Credit Form, including Supporting Documentation

WORKBOOK ACTIVITY (INDIVIDUAL)

Completing a LEED Online Credit Form, including Supporting Documentation

- Review requirements and documentation.
- Complete LEED Online credit form.
- Record findings in your participant workbook.



First Floor Plan

> "From an education standpoint, as a general contractor being **involved that early** in the process, that affords us the ability to get to **know the project** as much as we possibly can and then be able to **convey those desires** to our specialty contractors."

Kim Paxton, Director of Sustainable Construction, HITT Contracting

Phase 4 Summary

- Both project documents and LEED documents must communicate clearly.
- Use narratives effectively.
- Coordinate sub-contractors and suppliers early.
- Allow adequate time for Construction Document (CD) review.

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Phase 5 : Contract Administration

Implementing the ID+C Rating System

Phase 5: Contract Administration

- Hold construction kick-off.
- Confirm LEED schedule impacts.
- Evaluate LEED Materials Tracking Sheet.
- Evaluate submittal reviews.

THINK ABOUT IT

What strategies would you use on the construction site to support an integrative approach and LEED goals?

Hold Construction Charrette/Workshop

- LEED construction procedures, means, and methods
- Reconfirmation of LEED goals
- Construction Waste Management (CWM), Indoor Air Quality (IAQ), and Commissioning plans
- Contractor and subcontractor training
- Site visits as needed by LEED Champion
- Coordination with base building staff

Example: Indoor Air Quality Management Plan

Identify LEED Schedule Impacts via Highlighted Construction Schedule

- Supply chain management
- Materials / products
- IAQ plan before occupancy

LEED On-site Resources

Photos courtesy of Cici Coffee

Track LEED Construction Credits

- MRc1.2, MRc3: Reuse
- MRc2: Construction Waste
- MRc3-7: Material Costs
- MRc4-7: Recycled/Regional/Rapidly Renewable/ FSC Wood
- IEQc3.1, 3.2: IAQ Management
- Exemplary Performance thresholds

Complete Submittal Review Using Construction Submittal LEED Form

- Reviewed for LEED criteria form

Product for Review: Acoustical Tile #584

Project Target LEED Credits Listed Below

MR 4.1/4.2 Recycled Content
- This product contributes to this credit and the product is documented to contain 68% pre-consumer recycled content and 3% post-consumer recycled content.

Comments:
- Letter from Contractor listing both pre- and post-consumer recycled content is included.

❑ Ion Design has reviewed this product for LEED Compliance.
No additional information is required.
❑ Ion Design has reviewed this product for LEED Compliance.
Please gather the clarifications/documentation listed under each credit.

Construction Waste Management Report

WORKBOOK ACTIVITY (PAIRS)

Activity 5:
Analyze LEED Progress Reports to Monitor Status of Credits during Construction

Photo courtesy of FOX Architects

WORKBOOK ACTIVITY (PAIRS)

Analyze LEED Progress Reports to Monitor Status of Credits during Construction

- Review and discuss progress reports.
- Note risks possible and solutions in your participant workbook.

Phase 5 Summary

- Construction charrette
- Construction CWM and IAQ plans
- Schedule
- Centralized LEED resources
- Tracking of LEED credits
- Submittal review
- Progress reports
- Issues log

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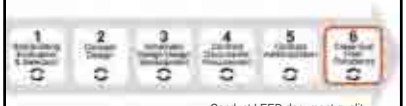
Photo by Steve Hall @Hedrich Blessing

Phase 6: Close-Out/ Post-Occupancy

Implementing the ID+C Rating System

Phase 6: Close-Out/Post-Occupancy



- Conduct LEED document quality control.
- Submit to LEED Online.
- Participate in GBCI review.
- Conduct user hand-off and training.
- Complete post-occupancy activities.

"GOLD STAR" QUESTION

What four items must remain consistent among all LEED credits?

LEED Document Quality Control

Prior to LEED Online Submittal:

- LEED Champion is the gatekeeper.
- Ensure consistency across credits.
- Double-check calculations.
- Upload project photographs and concise project narrative.
- Submit only those credits intended for review.

Site → Concept → Design → CD → CA → Close-Out

LEED Online Submission & GBCI Review

- Submission of LEED Construction Documents or Design + Construction Documents to LEED Online
- Preliminary review
- Clarifications
- Final review
- Appeal / Appeal review
- Certification acceptance
- Certification plaque

Site → Concept → Design → CD → CA → Close-Out

LEED Online Submission & GBCI Review

Site → Concept → Design → CD → CA → Close-Out

"GOLD STAR" QUESTION

Which LEED 2009 for Commercial Interiors credits are about operations, and not design and construction?

User Handoff & Training

- Tenant and base building facilities team
  - Training
  - Partnerships
  - Education

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THINK ABOUT IT

What have you learned from post- occupancy feedback that has benefited your later projects?

Post-Occupancy Activities

- Schedule facilities team LEED activities:
  - EA c2: Enhanced Commissioning
  - EA c3: Measurement & Verification (Case 2)
  - EA c4: Green Power
  - IEQc7.2: Thermal Comfort Survey
  - IDc1: Cleaning and Other Operational Credits

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Post-Occupancy Activities

- IEQc7.2: Thermal Comfort Survey

Thermal Environment Survey for LEED-CI 2.0 Credit 7.2

Date:
Time:
Approximate outside temperature: (F or C)
Sky: Clear Mostly Clear Mixed (Sun and Clouds) Overcast
Seasonal Conditions: Winter Spring Summer Fall
Occupant's Clothing:

Please refer to attached Table 1 (Sun, Hot/Humid, 55 Clo). Please check back mark to indicate all clothing that you are currently wearing on your Sun Hat Shirt. If you are wearing articles of clothing not listed, Clo their respective item into the lower provided boxes.

Site – Concept – Design – CD – CA – Close-Out

Occupants in sustainably designed green buildings demonstrate a 27% higher occupant satisfaction than the National Average.

"Assessing Green Building Performance: A post Occupancy evaluation of 12 GSA buildings," U.S. General Services Administration (June 2008).

Phase 6 Summary

- Importance of documenting quality control
- LEED Online submission/ GBCI final report
- User hand-over
- Post-occupancy resources/ results
- Facts about results and business metrics

Photo by: Eric Laignel

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Photo by: Eric Laignel

Course Summary

Implementing the ID+C Rating System

Learning Objectives Review

- Explained unique aspects of the LEED® 2009 for Commercial Interiors (CI) Rating System
- Recognized key green decisions throughout the LEED 2009 for CI process
- Implemented LEED 2009 for CI process for interior fit-up projects
- Applied integrative approach with project stakeholders

Review Main Themes

A special thank you to…

Herman Miller National Design Center, LEED Gold

- Owner: Herman Miller, Inc., Ray Kennedy, Director, Barry Warfield, Senior Project Manager
- Architect: Krueck & Sexton, Ron Krueck, Mark Sexton, Principals; Rico Cedro, Director of Sustainable Design
- Contractor: Owen-Ames-Kimball, Brad McAvoy, Director of Engineering Services
- Energy Model and Commissioning: GMB, Carl Manning, Project Engineer
- Lighting Designer: John Boesche Design, John Boesche, Principal
- Daylight Modeling: Schuler Shook, Jim Baney, Principal

Photo by Steve Hall©Hedrich Blessin

A special thank you to…

CB Richard Ellis, LEED Gold

- Leasing Agent: CB Richard Ellis — Patrick Marr, Sally Wilson, Art Santry, Chris Soucie, Chau Leung & Jennifer Ralph
- Project Manager: CB Richard Ellis —Dale Martin
- Building Owner: Brookfield Properties
- Architect: Lehman-Smith + McLeish — Debra Lehman-Smith, Jim McLeish & Ron Fiegenschuh
- Contractor: Rand Construction —Howard Chapman, Grant Stephens & Ed Wood
- LEED Consultant: H2EcoDesign, Holley Henderson & Melissa Solberg
- Mechanical Engineer: GHT, Ltd. Donna Delo, James Hansen & Patrick Kunze
- Commissioning Agent: CPM Scheduling — Jim McQuade
- Lighting Engineers: mcla — Scott Guenther

A special thank you to…

BP America, Inc., LEED Platinum

- Owner: BP America, Inc. — Tom Mueller, Press Officer
- Building Owner: Louis Dreyfus
- Architect: FOX Architects — Ted Milligan, Project Manager and Designer; Andy Yeh, Project Principal
- Mechanical Engineer: GHT LTD — James Hansen, Project Manager
- Contractors: HITT Contracting — Nicolas Vivas, Project Manager; Kim Pexton, Director of Sustainable Construction
- Commissioning Agent: CPM Scheduling — Jim McQuade

Photo courtesy of FOX Architecture

THINK ABOUT IT

What were your biggest "lessons learned" from today?

"Sustainability is most profound when you find it personally."

- Kai-Uwe Tiaud, DGS Lutzkes

Thank You

APPENDIX 6: ATTENDEES ID+C 301- IMPLEMENTING THE INTERIOR DESIGN & CONSTRUCTION LEED RATING SYSTEM

LEED 300-Interior Design and Construction
19th May 2011

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9.	Rashed Al Nasa'a	CC	rashed@ccjo.com	0795508023	
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إعداد شهادة LEED300 لـ (راشد بلسفة)

LEED 300-Interior Design and Construction
19th May 2011

JORDAN GBC

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