

## LEED Building Design and Construction

### Activity #1

Before completing this Activity Read: Reference Guide for Building Design and Construction v4 – Pages 4-

#### Fill-In, Multiple Choice, Matching

1. Buildings account for a significant portion of greenhouse gas emissions; in the U.S., buildings are associated with 38% of all emissions of Carbon dioxide; globally, the figure is nearly one-third.
2. Buildings have a major role to play in sustainability through their construction, the lifetime of their operation, and patterns of development.
3. Developed by the U.S. Green Building Council, LEED is a framework for identifying, implementing, and measuring green building and neighborhood design, construction, operations, and maintenance.
4. List the four main types of building categories the LEED rating systems address:
  1. Commercial
  2. institutional
  3. residential
  4. neighborhood developments
5. LEED emphasizes integrative design, integration of existing technology, and state-of-the-art strategies to advance expertise in green building and transform professional practice.
6. LEED for New Construction and Major Renovations was developed in 1998 for the commercial building industry and has since been updated several times.
7. These ongoing improvements, developed by USGBC member-based volunteer committees, subcommittees, and working groups in conjunction with USGBC staff, have been reviewed by the LEED Steering Committee and the USGBC Board of Directors before being submitted to USGBC members for a vote.
8. The LEED rating systems aim to promote a transformation of the construction industry through strategies designed to achieve seven goals. List the seven goals:
  1. To reverse contribution to global climate change.
  2. To enhance individual human health and well-being.
  3. To protect and restore water resources.
  4. To protect, enhance, and restore biodiversity and ecosystem services.
  5. To promote sustainable and regenerative material resources cycles.
  6. To build a greener economy
  7. To enhance social equity, environmental justice, community health, and quality of life. 1

9. List the name of each category and abbreviation for the major prerequisites and credits in the LEED BD+C rating system:
1. Location and Transportation (LT)
  2. Sustainable Sites (SS)
  3. Water Efficiency (WE)
  4. Energy and Atmosphere (EA)
  5. Materials and Resources (MR)
  6. Indoor Environmental Quality (EQ)
10. List the name and abbreviation of the bonus categories in the LEED BD+C rating system:
1. Innovation (IN)
  2. Regional Priority (RP)
11. Each credit in the rating system is allocated points based on the relative importance of its contribution to the goals.
12. LEED-certified buildings are designed to deliver the following benefits:
- Lower operating costs and increased asset value
  - Reduced waste sent to landfills
  - Energy and water conservation
  - More healthful and productive environments for occupants
  - Reductions in greenhouse gas emissions
  - Qualification for tax rebates, zoning allowances, and other incentives in many cities
13. The process begins when the owner selects the rating system and registers the project.
14. The project is then designed to meet the requirements for all prerequisites and for the credits the team has chosen to pursue.
15. After documentation has been submitted for certification, a project goes through what two reviews?
1. Preliminary
  2. Final
16. The preliminary review provides technical advice on credits that require additional work for achievement, and the final review contains the project's final score and certification level.
17. The decision can be appealed if a team believes additional consideration is warranted.

18. Complete the table for the LEED levels of certification:

Level of Certification	Points
certified	40-49
silver	50-59
Gold	60-79
Platinum	80 and above

19. Match the explanation to the credit structure:

Credit Structure	No.
Intent & Requirements	3
Behind the Intent	6
Step-By-Step Guidance	7
Further Explanation	5
Required Documentation	10
Related Credit Tips	8
Changes from LEED 2009	1
Referenced Standards	4
Exemplary Performance	9
Definitions	2

Explanation

1	is a quick reference of changes from the previous version of LEED.
2	gives the meaning of terms used in the credit.
3	outlines the rating system requirements for achieving the prerequisite or credit. They were approved through the rating system development process and can also be found on the USGBC website.
4	lists the technical standards related to the credit and offers weblinks to find them.
5	provides guidance for lengthy calculations or for special project situations, such as tips for nonstandard project types or different credit approaches. It includes a Campus section and, sometimes, an International Tips section.
6	connects credit achievement with larger sustainability issues and provides information on how the credit requirements meet the intent stated in the rating system.
7	suggests the implementation and documentation steps that can be used by most projects, as well as generally applicable tips and examples.
8	identifies other credits that may affect a project team's decisions and strategies for the credit in question; the relationships between credits may imply synergies or trade-offs.
9	identifies the threshold that must be met to earn an exemplary performance point, if available.
10	lists the items that must be submitted for certification review.

20. Campus multiple refers to the Campus Program for Projects on a shared Site, which certifies multiple buildings located on one site and under the control of a single entity.

21. List the two approaches to certifying multiple buildings under the Campus Program:

1. Group Approach
2. Campus Approach

22. Success in LEED and green building design is best accomplished through an integrative design process.

23. List the nine credit categories and their abbreviations found in the rating system BD+C.

1. Integrative Process (IP)
2. Location and Transportation (LT)
3. Sustainable Sites (SS)
4. Water Efficiency (WE)
5. Energy and Atmosphere (EA)
6. Materials and Resources (MR)
7. Indoor Environmental Quality (EQ)
8. Innovation (IN)
9. Regional Priority (RP)

24. The coordination of building and site systems should be addressed early, preferably before Schematic design.

25. List the three phases of the integrative process:

1. Discovery
2. Design and Construction
3. Occupancy, operation and performance feedback

26. \_\_\_\_\_ work should take place before schematic design begins.

27. List the steps for devising a LEED Work Plan:

- Step 1. Initiate Discovery Phase
- Step 2. Select LEED Rating System
- Step 3. Check Minimum Program Requirements
- Step 4. Establish Project Goals
- Step 5. Define LEED Project Scope
- Step 6. Develop LEED Scorecard
- Step 7. Continue Discovery Phase
- Step 8. Continue Iterative Process
- Step 9. Assign Roles and Responsibilities
- Step 10. Develop Consistent Documentation
- Step 11. Perform Quality Assurance Review and Submit for Certification

28. No more than 40% of the certifying gross floor area of a LEED project may consist of incomplete space unless the project is using the LEED BD+C: core and shell rating system.

29. Define previously developed.

*altered by paving, construction, and/or land use that would typically have required regulatory permitting to have been initiated (alterations may exist now or in the past).*

30. Improved parks with graded land and constructed features like playgrounds (e.g., a city park) are considered what type of land?

- A. Greenfield
- B. Developed
- C. Previously Developed
- D. Brownfield

31. A project's development footprint is all of its impervious surfaces.

32. Surfaces paved with pervious pavement (at least 50% permeable) are excluded from the development footprint.

33. List three ways that project density can be measured:

1. *Floor Area Ratio (FAR)*
2. *dwelling units per acre (DU/acre)*
3. *Square feet of building area per acre of buildable Land*

34. Project density does not include structured parking.

35. A project site has 24,000 square feet of buildable nonresidential land area. What should the building floor area be in order for the project to have a FAR of 2.2?

- A. 10,909 square feet
- B. 12,000 square feet
- C. 48,000 square feet
- D. 52,800 square feet

$$\text{Floor Area} = 2.2 \times 24,000 \text{ sf} = 52,800 \text{ sf}$$

36. List the two categories of users that most credits group users into:

1. *Regular Building Occupants*
2. *Visitors*

37. In the space provided write the two equations that can be used to determine a project's total number of FTE:

$$\text{FTE Employees} = \text{Full-time Employees} + \frac{\sum \text{daily part-time Employees}}{8}$$

$$\text{FTE Employees} = \frac{\sum \text{all employee hours}}{8}$$

38. List the types of regular building occupants used to determine occupancy:

1. Employees
2. Staff
3. Volunteers (regularly use a building)
4. Residents
5. Primary and Secondary School Students
6. Hotel Guests
7. Inpatients

39. List examples of what is considered a visitor (transient) for determining building occupancy:

1. Retail Customers
2. Outpatients
3. Volunteers (periodically use a building)
4. Higher-Education Students

40. What are the two ways that occupant types are counted for LEED calculations?

1. Daily Average
2. Peak Totals

41. If occupancy cannot be accurately predicted a project may use what resources to estimate occupancy?

1. Default Occupant density from ASHRAE 62.1-2010, Table 6-1
2. Default Occupant density from CEN Standard EN15251, Table B.2
3. Appendix 2 Default Occupancy Count
4. Results from applicable studies

42. The Minimum Program Requirements (MPRs) are the minimum characteristics that make a project appropriate to pursue LEED certification.

43. All LEED projects must be constructed and operated on a permanent location on existing land. No project that is designed to move at any point in its lifetime may pursue LEED certification.

44. The LEED project boundary must include all contiguous land that is associated with the project and supports its typical operations.

45. The gross floor area of the LEED project should be no less than 2% of the gross land area within the LEED project boundary.

46. LEED BD+C and LEED O+M Rating Systems

The LEED project must include a minimum of 1,000 square feet (93 square meters) of gross floor area.

47. LEED ID+C Rating Systems

The LEED project must include a minimum of 250 square feet (22 square meters) of gross floor area.

48. LEED for Neighborhood Development Rating Systems

The LEED project should contain at least two habitable buildings and be no larger than 1500 acres.

49. LEED for Homes Rating Systems

The LEED project must be defined as a "dwelling unit" by all applicable codes.

50. LEED for Building Design and Construction

Buildings that are new construction or major renovation. In addition, at least 60% of the project's gross floor area must be complete by the time of certification (except for LEED BD+C: core and shell).

51. LEED for Interior Design and Construction.

Interior spaces that are a complete interior fit-out. In addition, at least 60% of the project's gross floor area must be complete by the time of certification.

52. LEED for Building Operations and Maintenance.

Existing buildings that are undergoing improvement work or little to no construction.

53. LEED for Neighborhood Development

New land development projects or redevelopment projects containing residential uses, nonresidential uses, or a mix. Projects may be at any stage of the development process, from conceptual planning through construction. It is recommended that at least 50% of total building floor area be new construction or major renovation. Buildings within the project and features in the public realm are evaluated.

54. What is the name of the rule that provides guidance for making a decision of what rating system to use when several rating systems appear to be appropriate for a project?

40/60 Rule

55. If a rating system is appropriate for less than 40% of the gross floor area of a LEED project building or space, then that rating system should not be used.

56. If a rating system is appropriate for more than 60% of the gross floor area of a LEED project building or space, then that rating system should be used.

57. If an appropriate rating system falls between 40% and 60% of the gross floor area, project teams must independently assess their situation and decide which rating system is most applicable.

58. The entire gross floor area of a LEED project must be certified under a single rating system and is subject to all prerequisites and attempted credits in that rating system, regardless of mixed construction or space usage type.

59. Which of these must be satisfied in order to LEED certify a project? [Choose three]

- A. MPRs
- B. Project Checklist
- C. All prerequisites and credits for the rating system being used
- D. All prerequisites for the rating system being used
- E. Enough credits for the rating system being used to achieve the desired level of certification

60. Using the **Rating System Descriptions** below, place the number that best describes the type of building the rating system is appropriate for next to the rating system name:

- 5 LEED BD+C: New Construction and Major Renovation
- 9 LEED BD+C: Core and Shell Development
- 6 LEED BD+C: Schools
- 10 LEED BD+C: Retail
- 17 LEED BD+C: Data Centers
- 1 LEED BD+C: Warehouses and Distribution Centers
- 3 LEED BD+C: Hospitality
- 15 LEED BD+C: Healthcare
- 13 LEED BD+C: Homes and Multifamily Lowrise
- 20 LEED BD+C: Multifamily Midrise
- 11 LEED ID+C: Commercial Interiors
- 19 LEED ID+C: Retail
- 2 LEED ID+C: Hospitality
- 12 LEED O+M: Existing Buildings
- 21 LEED O+M: Retail
- 7 LEED O+M: Schools
- 16 LEED O+M: Hospitality
- 14 LEED O+M: Data Centers
- 4 LEED O+M: Warehouses and Distribution Centers
- 8 LEED ND: Plan
- 18 LEED ND: Built Project

**Rating System Descriptions**

1. Buildings used to store goods, manufactured products, merchandise, raw materials, or personal belongings, such as self-storage.
2. Interior spaces dedicated to hotels, motels, inns, or other businesses within the service industry that provide transitional or short-term lodging with or without food.
3. Buildings dedicated to hotels, motels, inns, or other businesses within the service industry that provide transitional or short-term lodging with or without food.
4. Existing buildings used to store goods, manufactured products, merchandise, raw materials, or personal belongings (such as self-storage).
5. New construction or major renovation of buildings that do not primarily serve K-12 educational, retail, data centers, warehouses and distribution centers, hospitality, or healthcare uses. New construction also includes high-rise residential buildings 9 stories or more.
6. Buildings made up of core and ancillary learning spaces on K-12 school grounds. LEED BD+C: Schools may optionally be used for higher education and non-academic buildings on school campuses.



7. Existing buildings made up of core and ancillary learning spaces on K-12 school grounds. May also be used for higher education and non-academic buildings on school campuses.
8. Projects in conceptual planning or master planning phases, or under construction.
9. Buildings that are new construction or major renovation for the exterior shell and core mechanical, electrical, and plumbing units, but not a complete interior fit-out. LEED BD+C: Core and Shell is the appropriate rating system to use if more than 40% of the gross floor area is incomplete at the time of certification.
10. Buildings used to conduct the retail sale of consumer product goods. Includes both direct customer service areas (showroom) and preparation or storage areas that support customer service.
11. Interior spaces dedicated to functions other than retail or hospitality.
12. Existing buildings that do not primarily serve K-12 educational, retail, data centers, warehouses and distribution centers, or hospitality uses.
13. Single-family homes and multi-family residential buildings of 1 to 3 stories. Projects 3 to 5 stories may choose the Homes rating system that corresponds to the ENERGYSTAR program in which they are participating.
14. Existing buildings specifically designed and equipped to meet the needs of high density computing equipment such as server racks, used for data storage and processing. LEED O+M: Data Centers only addresses whole building data centers.
15. Hospitals that operate twenty-four hours a day, seven days a week and provide inpatient medical treatment, including acute and long-term care.
16. Existing buildings dedicated to hotels, motels, inns, or other businesses within the service industry that provide transitional or short-term lodging with or without food.
17. Buildings specifically designed and equipped to meet the needs of high density computing equipment such as server racks, used for data storage and processing. LEED BD+C: Data Centers only addresses whole building data centers (greater than 60%).
18. Completed development projects.
19. Interior spaces used to conduct the retail sale of consumer product goods. Includes both direct customer service areas (showroom) and preparation or storage areas that support customer service.
20. Multi-family residential buildings of 4 to 8 occupiable stories above grade. The building must have 50% or more residential space. Buildings near 8 stories can inquire with USGBC about using Midrise or New Construction, if appropriate.
21. Existing buildings used to conduct the retail sale of consumer product goods. Includes both direct customer service areas (showroom) and preparation or storage areas that support customer service.