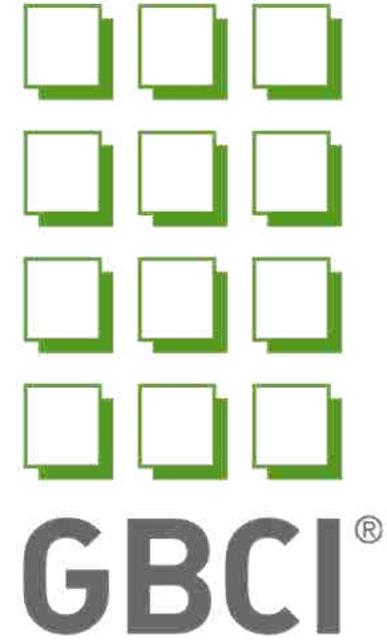# INTRODUCTION TO LEED GA CERTIFICATE

& KEY CONCEPTS:

(GLOBAL IMPACT, CREDENTIALS,

& CERTIFICATION LEVELS)

Overview of sustainable building credentials and certification impact

Presented by:
Mohamad Al-Hachoui

ABOUT THE PRESENTER

Mohamad Hachoui

MSc., B.Arch, PMP, LEED GA

Architect, PMP & FM Consultant

- More than 25 years of comprehensive experience in design, construction, project management consultancy, and facility management.

- Earned a Master's degree with distinction in **project management** from the University of Liverpool.

- Holds a Bachelor's degree in **Architecture**.

- Certified Project Management Professional (**PMP®**) by the Project Management Institute (**PMI**) in 2012.

- Certified LEED® Green Associate (**LEED GA**) by the Green Business Certification Inc. (**GBCI**) in 2017.

COURSE OBJECTIVES

أهداف الدورة

- Understand LEED philosophy and structure

- Apply sustainability concepts to projects

- Prepare for the LEED GA exam

- فهم فلسفة LEED وهيكله

- تطبيق مفاهيم الاستدامة على المشاريع

- الاستعداد لاختبار LEED GA

AGENDA

3 Modules

1. Introduction to LEED and the US Green Building Council (USGBC), & key definitions

2. Core Components and Credit Categories of LEED GA

3. LEED Certification Process and Exam Preparation

﴿ هُوَ أَنشَأَكُم مِّنَ الْأَرْضِ وَاسْتَعْمَرَكُمْ فِيهَا ﴾

[هود: 61]

" *We shape our buildings; thereafter they shape us* *"*

نحن نشكّل مبانينا، ثم تقوم مبانينا بتشكيلنا.

Winston Churchill

تستهلك المباني ما يقارب **40٪ من الطاقة** عالميًا وتصدر حوالي **30٪ من انبعاثات غازات الاحتباس الحراري**، ما جعل قطاع البناء <u>تحديًا في التغير المناخي</u>. ومنذ **التسعينات** بدأت الجهود العالمية لتنظيم هذا القطاع عبر أنظمة تقييم موحدة للمباني الخضراء.

على إثر هذه التهديدات، انطلقت المبادرات العالمية عام **1990** بنظام BREEAM في المملكة المتحدة، ثم تأسس مجلس المباني الخضراء الأمريكي **U.S. Green Building Council (USGBC)** عام **1993** وأطلق نظام LEED عام **1998**. وتجاوز اليوم عدد المحترفين أكثر من **+200,000** محترف معتمد.
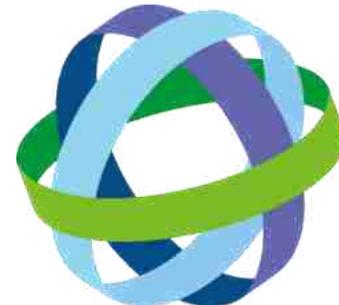
INTRODUCTION

For the last 18 years, various versions of LEED have pushed the global green building market forward progressively

على مدى السنوات الـ 18 الماضية، ساهمت الإصدارات المختلفة من نظام LEED في دفع سوق المباني الخضراء العالمية إلى الأمام بشكل تدريجي.

with more than **93,000** registered and certified projects

مع أكثر من **93,000 مشروع** مسجل ومعتمد

& more than **19 billion square feet** of space worldwide

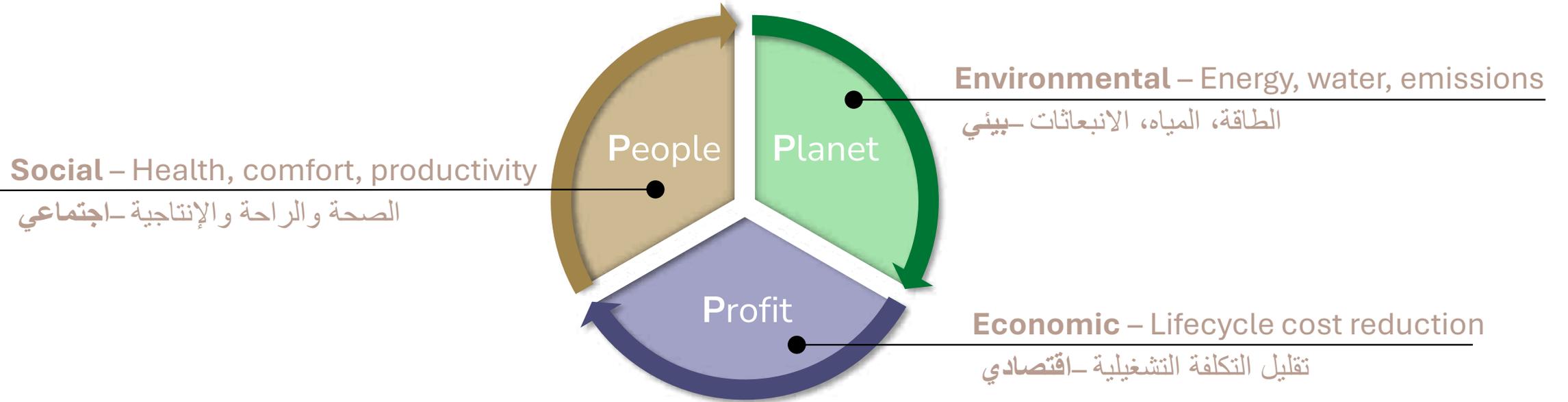وأكثر من نحو **1.76 مليار متر مربع** من المساحات حول العالم

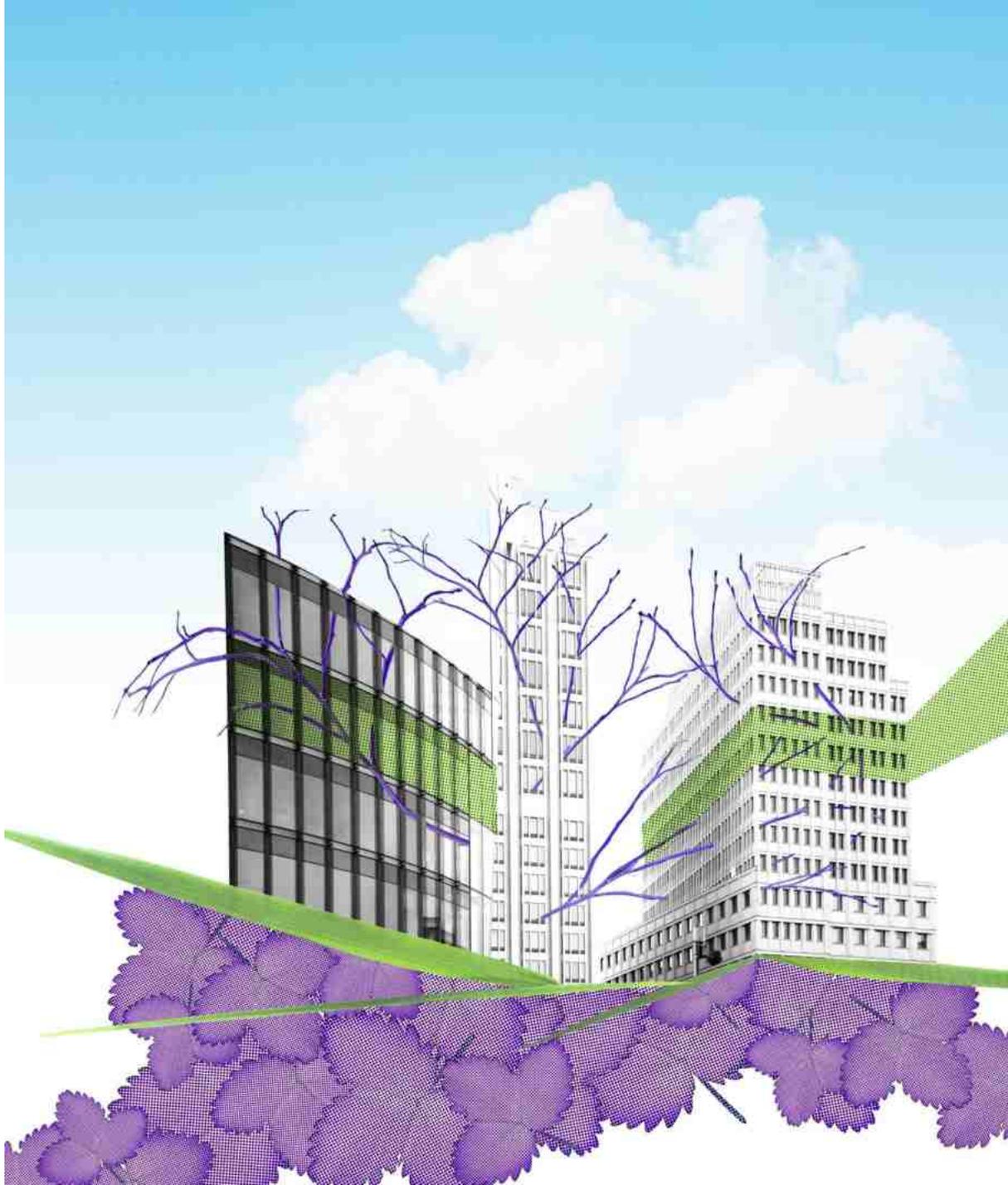*Reference: Guide to LEED v4.1BUILDING DESIGN AND CONSTRUCTION*

Why Green Buildings Matter?

لماذا المباني الخضراء مهمة؟

LEED is based on the **triple bottom line**

يعتمد LEED على مفهوم **الأبعاد الثلاثة للاستدامة**

People | Planet | Profit

Environmental – Energy, water, emissions

بيئي – الطاقة، المياه، الانبعاثات

Social – Health, comfort, productivity

اجتماعي – الصحة والراحة والإنتاجية

Economic – Lifecycle cost reduction

اقتصادي – تقليل التكلفة التشغيلية

IMPORTANCE OF LEED IN THE CONSTRUCTION AND DESIGN INDUSTRIES

Guidance for Sustainable Practices

LEED certification provides architects, engineers, and builders with clear sustainability guidelines to enhance environmental performance.

Compliance with Environmental Regulations

LEED helps projects comply with environmental laws, minimizing ecological impact and promoting responsible development.

Cost Reduction and Marketability

LEED certification contributes to lower operating costs and boosts property market value through sustainable features.

Module 1: **Generalities**

L   الريادة والقيادة في الأداء البيئي ← Leadership

E   كفاءة استخدام الطاقة ← Energy

E   حماية البيئة والاستدامة ← Environmental

D   تصميم المباني والأنظمة ← Design

Leadership in Energy and Environmental Design

الريادة في الطاقة والتصميم البيئي

WHAT IS LEED?

- Global green building rating system

- Voluntary and third-party verified

- Performance-based framework

ما هو نظام LEED؟

- نظام عالمي لتقييم المباني الخضراء

- نظام اختياري وتقييمه من جهة مستقلة

- إطار يعتمد على الأداء

HOW WAS LEED FOUNDED?

كيف تأسس نظام LEED؟

Origins of LEED

Developed by the **U.S. Green Building Council (USGBC)**

تم تطويره بواسطة مجلس المباني الخضراء الأمريكي (USGBC)

Initiated in the **late 1990s**

بدأ في أواخر التسعينات

First pilot version released in **1998**

الإصدار التجريبي الأول عام 1998

Purpose

Create a **common standard** for green buildings

وضع معيار موحد للمباني الخضراء

Provide **third-party verification**

الحصول على اعتماد من جهة مستقلة

Encourage market-driven **sustainability**

دعم الاستدامة بسوق المشاريع

Key Drivers

- Rising energy consumption in buildings

  الارتفاع الكبير في استهلاك الطاقة بالمباني

- Environmental impact & emissions

  التأثير البيئي والانبعاثات

- Lack of measurable sustainability benchmarks

  غياب مؤشرات قابلة للقياس للاستدامة

Market Needs

- Distinguish real green buildings from "greenwashing".

  التمييز بين الاستدامة الحقيقية والادعاءات التسويقية

- Support informed investment decisions

  دعم قرارات الاستثمار الواعي

- Improve building performance over lifecycle

  تحسين أداء المبنى خلال دورة حياته

LEED PHILOSOPHY

ما هي فلسفة LEED؟

Core Principles

What LEED GA Is NOT

✅ Performance-based evaluation

تقييم قائم على الأداء

✅ Holistic sustainability

استدامة شمولية

✅ Lifecycle thinking

التفكير في دورة الحياة

✅ Continuous improvement

التحسين المستمر

❌ Not a building code

ليس كود بناء

❌ Not mandatory

غير إلزامي

❌ Non-technology specific

غير مرتبط بتقنيات محددة

L E E D

v1.0
Pilot program

برنامج تجريبي

1998

v2.0
Structured rating system

نظام تقييم مضبط

2000-2008

v3.0
Standardized 100-point scale

اعتماد مقياس 100 نقطة

2009

v4.0
Focus on performance, materials, and transparency

التركيز على الأداء والمواد والشفافية

2013

v4.1
Market feedback & flexibility

تحسينات بناءً على ملاحظات السوق

2019

v5.0
Climate action, equity, resilience

العمل المناخي والعدالة والمرونة

2024-

LEED Version Evolution Timeline

INTRODUCTION TO LEED AND THE US GREEN BUILDING COUNCIL (USGBC)

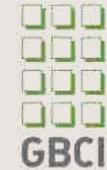# DEFINITIONS

تعريفات

DEFINITIONS

تعريفات

USGBC   vs   GBCI

USGBC =

United States Green Building Council

❑ USGBC is the **LEED rating system developer & education provider**.

❌ Does **not** administer exams

❌ Does **not** issue professional credentials

GBCI =

Green Business Certification Inc.

❑ GBCI is the **credentialing and certification body**.

❌ Does **not** develop LEED rating systems

❌ Does **not** set credit requirements

USGBC's Vision

Buildings and communities will regenerate and sustain the health and vitality of all life within a generation.

USGBC's mission is to:

• Promote **sustainability in the built environment**
• Improve **environmental performance**
• Support **human health and well-being**

LEED GA is addressed for:

architects, engineers, landscape architects, civil engineers, contractors, facility managers.

USGBC **VS** GBCI

❑ USGBC develops the LEED rating systems

تطور أنظمة تقييم LEED

❑ Provides education, research, and advocacy

يقدم التعليم والدعم

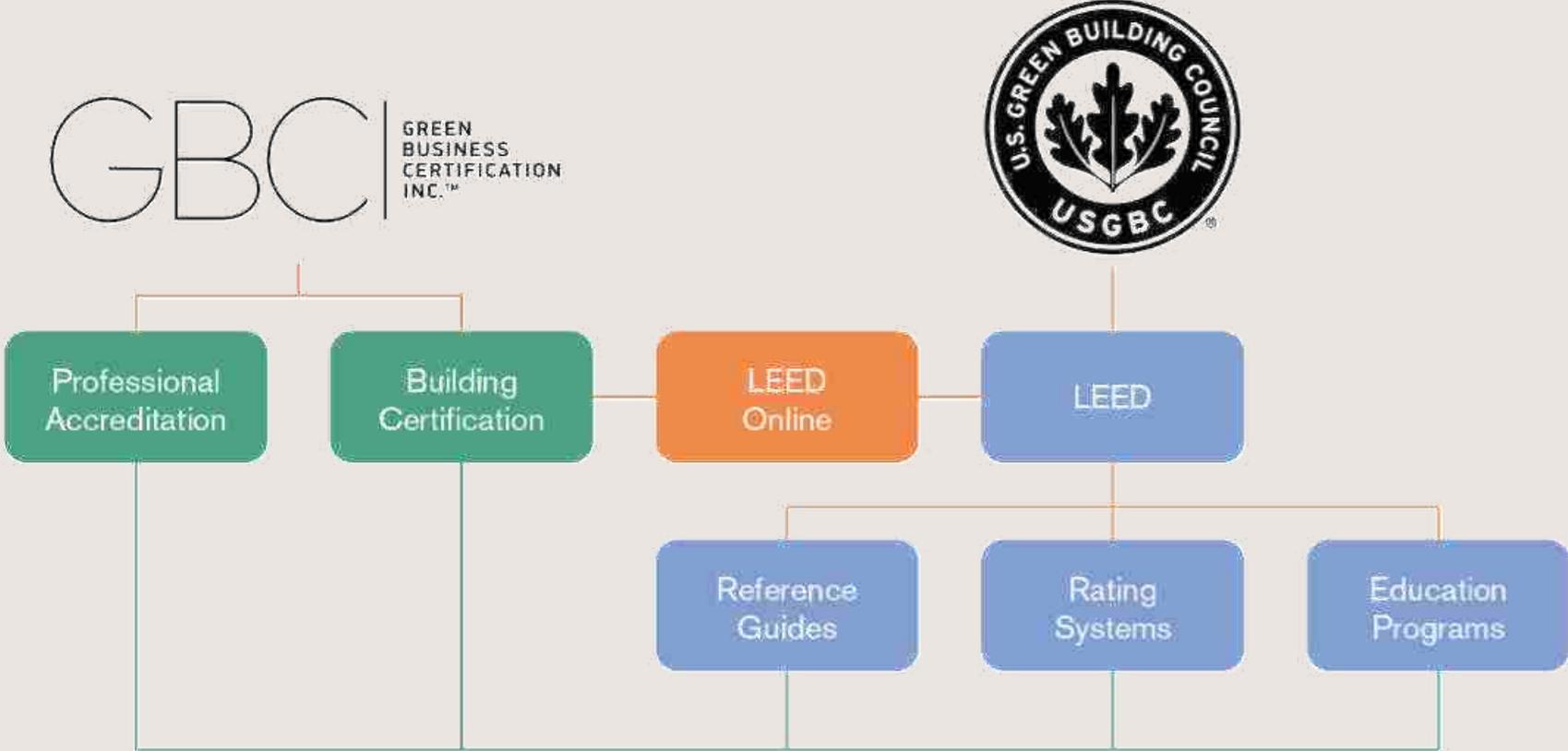❑ Drives market transformation toward sustainability

❑ Administers exams

إدارة الامتحانات

❑ Manages credentials

منح الاعتمادات

يقود تحول السوق نحو الاستدامة

DEFINITIONS

تعريفات

DEFINITIONS

تعريفات

Credentials

الاعتماد المهني

The most widely used green building rating system

1 **LEED Green Associate**

A foundational professional credential signifying core competency in **green building principles**

2 **LEED AP (with specialty)***

An advanced professional credential signifying expertise in green building and a **specific LEED rating system**

Individuals have the option to take the exam at a Prometric Testing Center or as a remote proctored online exam

* Candidates must first pass the LEED Green Associate exam

Credentials **الاعتماد المهني**

(3) **LEED Fellows**

have acquired <u>significant technical knowledge</u> and skills

(4) **LEED Green Rater**

Provides verification services for LEED <u>residential projects</u>

(5) **LEED Green Classroom Professional**

Gain a foundational knowledge of green building and the LEED green building rating system <u>in the context of a school setting</u>

Credential =   **= الاعتماد المهني**

A **credential** is a **formal professional recognition** granted to an individual to verify their **knowledge, competence, or qualification** in a specific field, typically earned through **education, examination, and ongoing maintenance**.

الاعتماد المهني (Credential) هو **اعتراف رسمي** يُمنح للمتخصصين لإثبات **المعرفة والكفاءة المهنية** في مجال المباني الخضراء، ويتم الحصول عليه عادةً من خلال **اجتياز اختبار معتمد** مع الالتزام بمتطلبات الاستمرار والتجديد.

Certificate =   **شهادة =**

A **certificate (certification)** is a **formal recognition awarded to a project, building, or organization** to confirm that it **meets specific standards or performance requirements**, based on an **independent review and verification process**.

الشهادة (Certification) هي اعتماد رسمي يُمنح لمشروع أو مبنى أو **جهة** للتأكيد على أنه **حقق متطلبات ومعايير أداء محددة،** وذلك بعد **مراجعة وتحقق مستقل.**

Credit =   = الرصيد

المتطلب الإلزامي =   = Prerequisite

A **credit** is an **optional LEED requirement** that a project may pursue to **earn points** toward LEED certification (A total of 100 points).

A **prerequisite** is a **mandatory LEED requirement** that **must be met** for a project to achieve LEED certification and **does not earn points**.

الرصيد (Credit) هو متطلب **اختياري** في نظام LEED يمكن للمشروع تحقيقه من أجل **كسب نقاط** تُضاف إلى مجموع نقاط الشهادة (من 110 نقاط).

المتطلب الإلزامي(Prerequisite) هو متطلب **إجباري** في نظام LEED يجب تحقيقه للحصول على الشهادة، **ولا يمنح أي نقاط.**

SMACNA	ISO 14001	Water Sense (EPA)	ENERGY STAR (EPA)	EPA	ASHRAE 62.1	ASHRAE 52.2	ASHRAE 55	ASHRAE 90.1	المنظمة / المعيار
HVAC ductwork construction	Environmental management systems	Program promoting water-efficient products	Program for energy-efficient buildings and equipment	U.S. agency for environmental protection	Ventilation & indoor air quality	Air Filters	Thermal Comfort	Energy efficiency	التعريف (EN)
معايير تنفيذ مجاري الهواء لأنظمة التكييف	أنظمة الإدارة البيئية	برنامج لترشيد استهلاك المياه	برنامج لكفاءة الطاقة للمباني والمعدات	وكالة حماية البيئة الأمريكية	معيار التهوية وجودة الهواء الداخلي	فلاتر الهواء	التكيف الحراري	معيار كفاءة الطاقة للمباني	التعريف (AR)
EQ	MR	WE	EA	EA – WE	EQ	EQ	EQ	EA	أين يظهر في LEED

GA understands them, AP applies them

DEFINITIONS

تعريفات

MUST memorize

MUST understand

💧 **Water Efficiency (WE)**

🚗 **Location & Transportation (LT)**

- **Water Closet (WC)**: **1.6 gpf** (Baseline)

- **Urinal**: **1.0 gpf** (Baseline)

- **Kitchen Faucet**: **2.2 gpm**

- **Showerhead**: **2.5 gpm**

- **gpf** = gallons per flush

- **gpm** = gallons per minute

- **Parking reduction**:
  - تقليل عدد مواقف السيارات
- **Preferred parking**:
  - للمركبات منخفضة الانبعاثات
  - لمشاركة السيارات(Carpool)
- **Bicycle Facilities**:
  - مواقف دراجات + غرف تبديل / دوش
- **Building Density (Nonresidential)**:
  - Floor Area / Acre of Buildable Land

DEFINITIONS

تعريفات

MUST understand

MUST understand

📘 Indoor Environmental Quality (EQ)

⚡ Energy & Atmosphere (EA)

•**Radon**:
- غاز طبيعي مشع
- مسرطن

•**Low-Emitting Materials**:
- دهانات، لواصق، أرضيات

•**Ventilation**:
- **ASHRAE 62.1** تعتمد على

•**Thermal Comfort**:
- راحة المستخدم (حرارة + رطوبة)

- أعلى وزن نقطي
- **ASHRAE 90.1** يعتمد على
- **Commissioning**:
  ○ التحقق من أداء الأنظمة
  ○ ليس صيانة

🧱 Materials & Resources (MR)

• **Construction Waste Management**
• **Life Cycle Thinking**
• **Recycled Content**

LEED minimum program requirements (MPR)

المتطلبات الأساسية لبرنامج LEED

❑ Minimum Program Requirements are a set of **baseline eligibility criteria** that every LEED project must meet in order to **register, pursue certification, and remain certified**.

❑ المتطلبات الأساسية لبرنامج LEED هي **شروط أهلية إلزامية** يجب على كل مشروع تحقيقها ليتمكن من **التسجيل والحصول على شهادة LEED والاستمرار فيها**.

1	2	3
Must be in a Permanent Location on Existing Land يجب أن يكون في موقع دائم على أرض قائمة	**Must Use Reasonable LEED Boundaries** يجب استخدام حدود معقولة لنظام LEED	**Must Comply with Project Size Requirements** يجب الالتزام بمتطلبات حجم المشروع

Each LEED Rating System Has 3 Identical MPRs

1 Must Be in a Permanent Location on Existing Land
- Cannot be designed to move
  Trailers or portable buildings are not eligible

2 Must Use Reasonable LEED Boundaries
- Include all contiguous land associated with the project
  (e.g., sidewalks, parking, stormwater treatment, landscaping)
- Must not exclude portions of the site to make certification easier
  (**No** "gerrymandering" of boundaries)
- Gross Floor Area must exceed 2% of the project boundary

3 Must Comply with Minimum Project Size Requirements (GFA)
- **BD+C and O+M:** Minimum 1,000 sq ft (93 m²)
- **ID+C:** Minimum 250 sq ft (22 m²)
- **ND:** At least two habitable buildings; max 1,500 acres (~6 km²)
- **Homes:** Must qualify as a dwelling unit under applicable codes

Site Boundary vs LEED Project Boundary

◆ Key Definitions

Building Footprint
- Area defined by the perimeter of the building plan
- Does **NOT** include pavements, landscaping, or parking

Development Footprint
- Total disturbed area of the site
- Includes building + pavements + parking + landscaping + roads
- Represents all site alterations

Property Boundary
- Entire legal site boundary
- Includes constructed and non-constructed areas

◆ LEED Project Boundary
- Portion of the site submitted for LEED certification
- Must include:
  - Building footprint
  - All land affected by the development
- Cannot exclude site portions to gain unfair credit advantage
  (**No boundary gerrymandering**)

📌 In multi-building developments, the LEED boundary may be a portion of the overall property — but must follow reasonable LEED boundary rules.

REGISTER FOR THE LEED GA EXAM

التسجيل لامتحان LEED GA

To register for the LEED GA exam, Visit: https://www.usgbc.org/credentials

REGISTER FOR THE LEED GA EXAM

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REGISTER FOR THE LEED GA EXAM

التسجيل لامتحان LEED GA

Next Steps

❑ If you're a student be sure to check that box when registering, and you test for only **$100**

❑ USGBC members test for **$200** and non-members can take the test for **$250**

❑ Pay your exam fee and save the code that you get somewhere handy

❑ You'll then go to www.prometric.com and use that code to book your test day, time, and location

❑ There are no formal education or experience requirements to sit for the LEED Green Associate exam

Exam Structure

Knowledge Domain	Questions
LEED Process	16
Integrative Strategies	8
Location and Transportation	7
Sustainable Sites	7
Water Efficiency	9
Energy and Atmosphere	10
Materials and Resources	9
Indoor Environmental Quality	8
Project Surroundings and Public Outreach	11
The exam contains 15 unscored "beta" questions	

❑ To maintain and renew the credential, all LEED professionals must earn and report continuing education (CE) hours within a 2-year cycle

❑ A LEED Green Associate must earn and report 15 CE hours (3 must be LEED-specific)

❑ LEED APs with specialty must earn and report 30 CE hours (6 must be LEED-specific)

You have **2-hours** to take **100** multiple-choice questions. You are tested over LEED v4 and all the LEED v4 Rating Systems

REGISTER FOR THE LEED GA EXAM

التسجيل لامتحان LEED GA

The <u>primary language</u> for the exam is **English**. In the case of any discrepancies between the original English content and the translated content or challenges made to the exams, the English content will be used as the basis of consideration. <u>Translation is offered solely as an aid</u> to non-native English speakers and is currently provided in **French**, **Spanish**, **Brazilian Portuguese**, **Arabic**, and **Chinese** for the LEED® Green Associate™, LEED® BD+C and LEED O+M exams.

Credentials	Certification
For professionals	For Buildings
الاعتماد المهني هو مؤهل يُمنح **لشخص** ويثبت معرفته أو خبرته في نظام LEED ومفاهيم المباني الخضراء.	**شهادة المشروع** هي الاعتراف الرسمي بأن **مبنى أو مشروعًا** قد استوفى متطلبات نظام LEED

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بشهد نظام LEED انتقالًا من الإصدار الرابع LEED v4 إلى الإصدار الخامس LEED v5،
مع تغيّر مواعيد وآلية اختبارات الشهادات.

☐ LEED Green Associate (v4) متاح حتى   **26 أبريل 2026**

☐ اختبارات LEED AP بجميع تخصصاتها متاحة حتى   **28 يونيو 2026**

☐ قد يكون التقدّم لاختبارات الإصدار الحالي فرصة مناسبة لمن يخطط
للحصول على الشهادة قريبًا.

البند	LEED v4	LEED v4.1	LEED v5
سنة الإطلاق	2014	2019	2025–2026
الفلسفة العامة	مبانٍ خضراء متوازنة	تحسين الأداء القابل للقياس	مواجهة تغيّر المناخ
التركيز الأساسي	كفاءة الطاقة، المياه، المواد	الأداء الفعلي والبيانات	إزالة الكربون (Decarbonization)
مواءمة أهداف المناخ	محدودة	جزئية	مرتبطة بأهداف 2030 و2050
محاور التقييم	استدامة عامة	أداء ونتائج	Climate – Health – Equity
الجمهور المستهدف	المبتدئون والمحترفون	الممارسون	المشاريع والمؤسسات ذات الأثر المناخي

Module 2: **Rating systems & Credit categories**

UNDERSTANDING THE FUNDAMENTALS OF LEED

❑ LEED is the <u>most widely</u> used green building rating system

❑ نظام LEED هو نظام تصنيف المباني الخضراء <u>الأكثر استخدامًا</u> على نطاق واسع

❑ LEED-certified green buildings are <u>better-performing buildings</u>

❑ المباني الخضراء الحاصلة على شهادة LEED هي <u>مبانٍ أفضل أداءً</u>

❑ LEED is designed for <u>all building types</u> and phases

❑ تم تصميم نظام LEED لجميع أنواع المباني ومراحلها

☐ **LEED BD+C** – New Construction

☐ تصميم وإنشاء (المباني الجديدة)

☐ **Best rating system identification**

☐ **LEED ID+C** – Interior fit-out

☐ التصميم الداخلي والإنشاء للمباني

- **New hospital**
  مستشفى جديد → **BD+C**

☐ **LEED O+M** – Existing buildings

☐ التشغيل والصيانة (المباني القائمة)

- **Office fit-out**
  تشطيب داخلي → **ID+C**

LEED Homes / **ND** / **Cities**

☐ المنازل/المواقع المجاورة/المدن

- **Existing office**
  مبنى قائم → **O+M**

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OVERVIEW OF THE LEED GREEN BUILDING RATING SYSTEM

Energy Efficiency

LEED emphasizes reducing energy consumption to promote sustainable and cost-effective building operations.

Water Savings

Water conservation is a key LEED criterion, encouraging efficient water usage and management in buildings.

Materials Selection

LEED promotes using sustainable and environmentally friendly building materials to reduce impact.

Indoor Environmental Quality

Improving indoor air quality and occupant comfort is a vital LEED focus area for healthy environments.

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

❑ LEED for Building Design and Construction (**LEED BD+C**) provides a **framework** for building a holistic green building

❑ يوفّر نظام LEED لتصميم وبناء المباني (**LEED BD+C**) إطارًا لبناء مبنى أخضر متكامل

❑ **LEED BD+C** applies to most project types, including:

- Data centers

- Healthcare

- Hospitality

- Retail

- Schools

- Warehouses and distribution centers

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

Major Renovation (LEED Definition)
A project qualifies as a **Major Renovation** if it includes one or more of the following:
•**Building envelope changes**
•**HVAC system changes**
•**Major interior changes**

LEED BD+C (Building Design & Construction)
Applicable rating systems include:
•LEED BD+C: New Construction
•LEED BD+C: Core & Shell
•LEED BD+C: Schools
•LEED BD+C: Retail
•LEED BD+C: Healthcare
•LEED BD+C: Data Centers
•LEED BD+C: Hospitality
•LEED BD+C: Warehouses & Distribution Centers
➡ Typically applies to buildings **9 floors and more** (high-rise applicability reference).

BD+C

BUILDING DESIGN + CONSTRUCTION

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

❑ **LEED ID+C** works as an organizational framework to design and build interior spaces. It's dedicated to all project types from office spaces to coffee shops.

❑ يعمل نظام **LEED ID+C** كإطار تنظيمي لتصميمي الفراغات الداخلية وإنشائها. وهو مخصص لجميع أنواع المشاريع، من مساحات المكاتب إلى المقاهي.

❑ **LEED ID+C** applies to most project types, such as retail and hospitality

❑ ينطبق نظام **LEED ID+C** على معظم أنواع المشاريع مثل قطاعي التجزئة والضيافة.

ID+C
Interior Design + Construction

❑ **LEED ID+C** has options to fit every project

❑ يوفر نظام **LEED ID+C** خيارات تناسب كل مشروع

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

LEED for Interior Design & Construction (ID+C)
Used for **interior fit-out projects** (tenant improvements).

☐1 **LEED ID+C: Retail**
•Interior projects for:
  • Banks
  • Restaurants
  • Apparel stores
  • Electronics stores
  • Big-box retail
•Focuses on retail-specific operational needs.

☐2 **LEED ID+C: Hospitality**
•Interior spaces for:
  • Hotels
  • Motels
  • Inns
  • Short-term lodging facilities
•May include food service.
•Designed for transitional/service industry occupancy.

☐3 **LEED ID+C: Commercial Interiors**
•For **tenant spaces** in commercial buildings
•Excludes retail and hospitality
•Typical examples:
  • Office spaces
  • Corporate interiors

ID+C

INTERIOR DESIGN • CONSTRUCTION

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

❑ **LEED O+M** certification works for existing buildings and spaces

❑ شهادة **LEED O+M** مناسبة للمباني والمساحات القائمة

O+M
Operations and Maintenance

❑ **LEED O+M** works for all project types from office spaces and restaurants to data centers and schools.

❑ يعمل نظام **LEED O+M** مع جميع أنواع المشاريع، من المساحات المكتبية والمطاعم إلى مراكز البيانات والمدارس.

❑ **LEED O+M** applies to most project types such as schools, retail, data centers, and hospitality.

❑ ينطبق نظام **LEED O+M** على معظم أنواع المشاريع مثل المدارس ومتاجر التجزئة ومراكز البيانات والضيافة.

LEED for Building Operations & Maintenance (O+M)
🔹 **Purpose**
•Applies to **existing buildings**
•Focuses on **sustainable operations and maintenance**
•Covers:
- Ongoing performance
- System upgrades
- Minor space-use changes

Rating System Adaptations
1 **O+M: Existing Buildings**
•General existing building operations
2 **O+M: Hospitality**
•Existing hotels, motels, inns
•Short-term lodging (with or without food service)
3 **O+M: Data Centers**
•Existing facilities with:
- High-density computing
- Server racks
- Data storage & processing

4 **O+M: Warehouses & Distribution Centers**
•Existing buildings used for:
- Storage
- Distribution
- Raw materials
- Self-storage

5 **O+M: Retail**
•Existing retail buildings
•Includes:
- Customer service areas (showrooms)
- Storage/preparation areas supporting sales

6 **O+M: Schools**
•K–12 academic buildings
•Can include campus buildings

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

❑ **Homes** are the most important places in our lives

❑ **المنازل** هي أهم الأماكن في حياتنا

❑ **LEED**-certified **green homes** use less energy and fewer resources

❑ تستخدم **المنازل الخضراء** الحاصلة على شهادة **LEED** طاقة أقل وموارد أقل

❑ **LEED**-certified **green homes** are healthier for you and your family

❑ **المنازل الخضراء** الحاصلة على شهادة **LEED** هي خيار صحي لك ولعائلتك

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

◆ **LEED Homes: Single Family & Multifamily Low-Rise**
•Single-family housing
•Multifamily housing
•**1–3 habitable stories**

◆ **LEED Homes: Multifamily Midrise**
•Multifamily residential buildings
•**4–8 habitable stories above grade**

HOMES

Homes

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

❑ **LEED (ND)** is appropriate for new land development projects
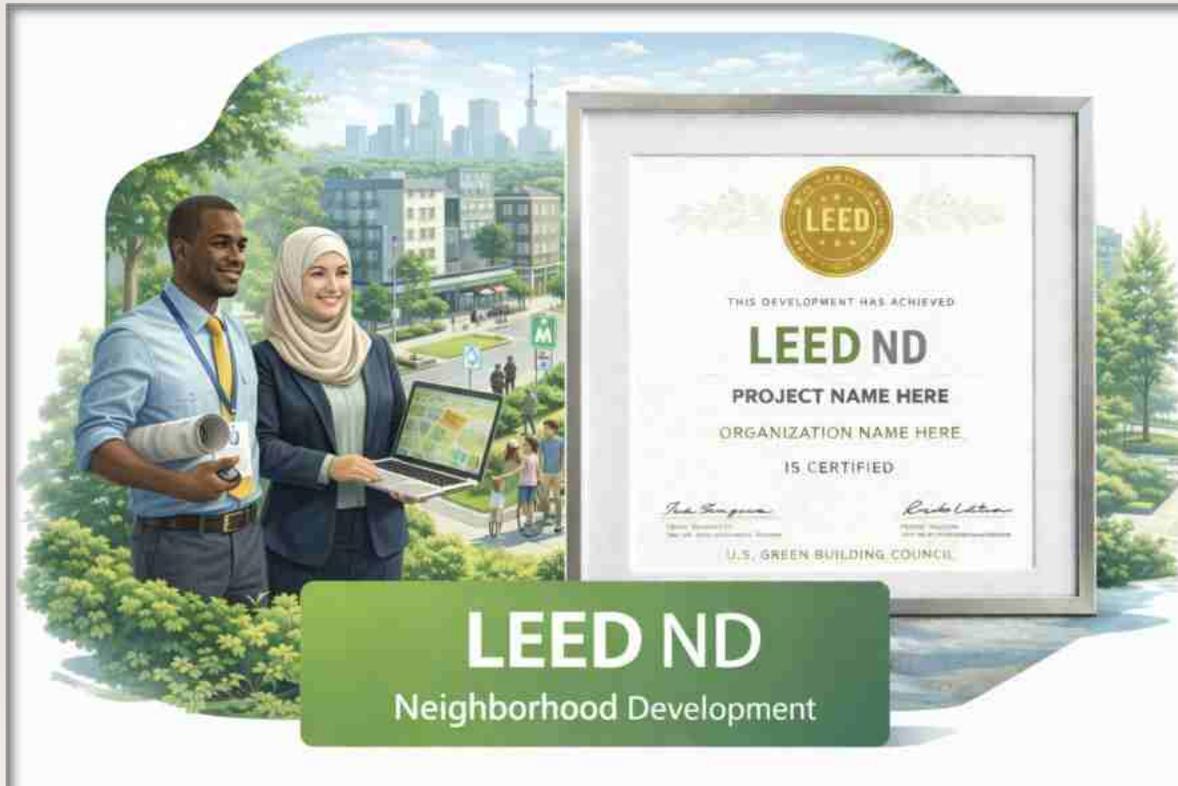
❑ يُعد نظام **LEED (ND)** مناسبًا لمشاريع تطوير الأراضي الجديدة

LEED ND
Neighborhood Development

❑ **LEED (ND)** is applicable for residential uses, nonresidential uses, or a mix

❑ ينطبق نظام **LEED (ND)** على الاستخدامات السكنية، أو الاستخدامات غير السكنية، أو مزيج منهما.

❑ **LEED (ND)** was engineered to inspire and help create better, more sustainable, well-connected neighborhoods

❑ صُممت شهادة **LEED (ND)** لإلهام ومساعدة الأحياء على أن تكون أفضل وأكثر استدامة وترابطًا.

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

◆ **LEED ND: Plan**

• For **conceptual planning**
• Master planning phase
• Can include projects **under construction**

◆ **LEED ND: Build Project**

• For **completed development projects**
• Applied after development is built

LEED RATING SYSTEMS

ما هي أنظمة LEED؟

❑ **LEED for Cities** and **LEED for Communities** advance sustainable development for cities and communities
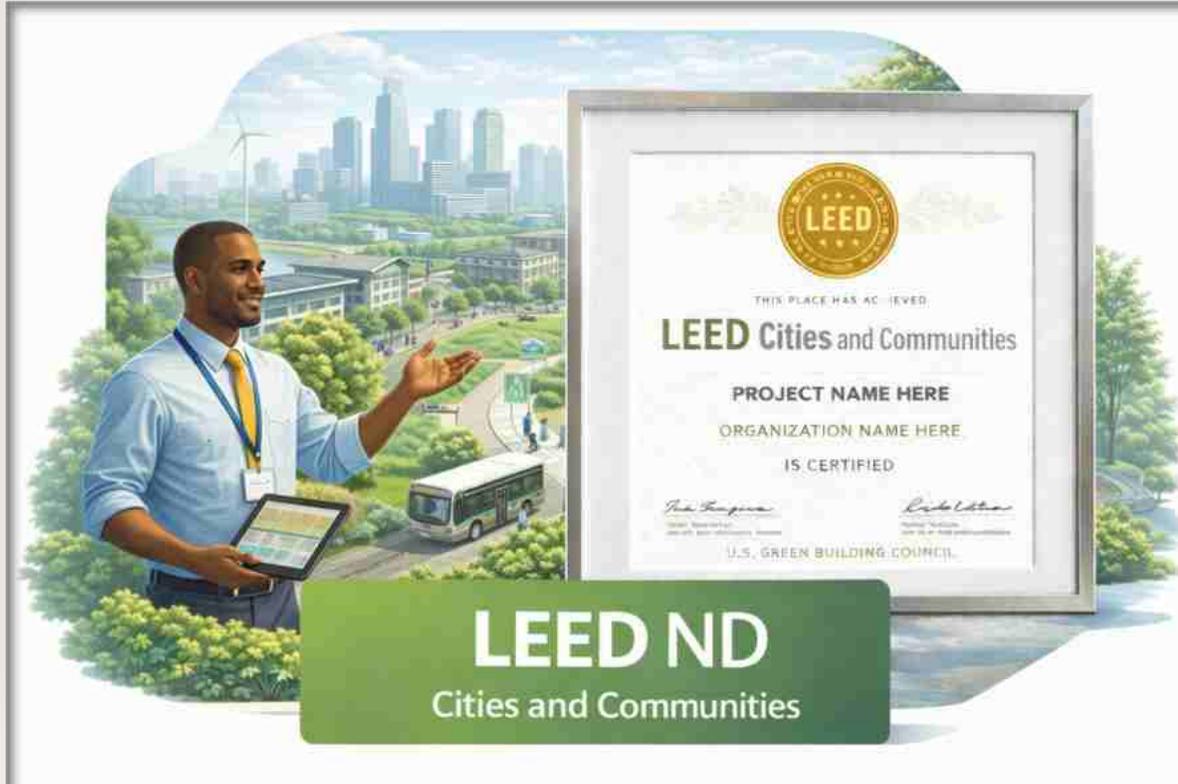
❑ يتجاوز برنامج **LEED للمدن والمجتمعات** نطاق المباني لتعزيز التنمية المستدامة على مستوى المدينة والمجتمع.

❑ **LEED for Cities and Communities** certification program is aligned with the UN Sustainable Development Goals

❑ يتوافق برنامج شهادة **LEED للمدن والمجتمعات** مع أهداف الأمم المتحدة للتنمية المستدامة.

2.3 What happens when more than one rating system is applicable for a project?

Most projects fit into a particular rating system, there may be cases where a project is applicable for more than one rating system. Following guidelines are to be used under such scenario:

- Apply 60/40 rule i.e. select the rating system, which is applicable for 60% or more the project area.

- The rating system which is most applicable for the project should be selected.

Percentage of floor area appropriate for a particular rating system

Should not use that rating system	Project team's choice	Should use that rating system

0%	40%	60%	100%
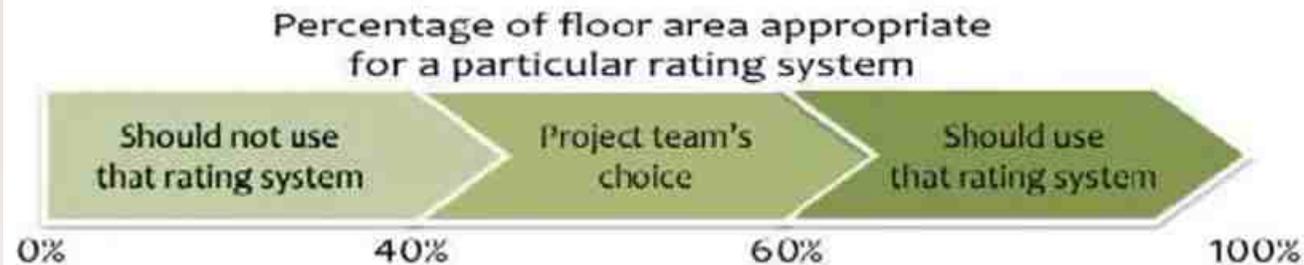
LEED RATING SYSTEMS

ما هي أنظمة LEED؟

Combination of rating systems and building types

LEED FOR Building Design and Construction	LEED BD+C: New Construction LEED BD+C: Core and Shell LEED BD+C: Schools LEED BD+C: Retail LEED BD+C: Healthcare LEED BD+C: Data Centers LEED BD+C: Hospitality LEED BD+C: Warehouses and Distribution Centers LEED BD+C: Homes LEED BD+C: Multifamily Midrise
LEED FOR Interior Design and Construction	LEED ID+C: Commercial Interiors LEED ID+C: Retail LEED ID+C: Hospitality
LEED FOR Building Operations and Maintenance	LEED O+M: Existing Buildings LEED O+M: Data Centers LEED O+M: Warehouses and Distribution Centers LEED O+M: Hospitality LEED O+M: Schools LEED O+M: Retail
LEED FOR Neighborhood Development	LEED ND: Plan LEED ND: Built Project
LEED FOR Homes Design and Construction	Homes and Multifamily Lowrise: Designed for single family homes and multifamily buildings between one and three stories. Multifamily Midrise: Designed for midrise multifamily buildings between four and eight stories.

FEATURED PROJECT

ما هي أنظمة LEED؟

مشروع: (Terra – Sustainability Pavilion (Expo 2020 Dubai

البند	المعلومات
اسم المشروع	جناح الاستدامة – تيرا (Terra)
الموقع	دبي، الإمارات العربية المتحدة
نوع المشروع	مبنى ثقافي / معارض (Landmark Public Building)
نظام LEED	LEED BD+C
مستوى الشهادة	LEED Platinum
سنة الاعتماد	2021
جهة الاعتماد	**GBCI**

PROJECT CERTIFICATION PROCESS

خطة شهادة الاعتماد LEED

Define LEED Version	Determine a Building Type	Choose the best Rating System	Check Minimum Program Requirements (MPRs)	Register the project	Submit documentation as per the Credit requirements	Certification Decision
LEED v4.1 (المعتمد حاليًا)	• Office • Retail • Healthcare • Residential • Existing • Interior Fit-out	• BD+C • ID+C • O+M • Homes • ND • Cities & Communities	1. Permanent Location 2. Reasonable Boundaries 3. Comply with Project Size Requirements	• LEED Online • Arc Platform	• Earn points	• Certified: 40–49 • Silver: 50–59 • Gold: 60–79 • Platinum: 80–110

20 min break

Refresh, and get back...

LEED CREDIT CATEGORIES
(V4 / V4.1)

LEED CREDIT CATEGORIES

فئات تقييم LEED

LEED credit categories are thematic groups that organize LEED requirements according to **specific sustainability goals**, such as <u>energy efficiency</u>, <u>water conservation</u>, and <u>occupant health</u>. There are 9 categories in LEED v4.1

فئات تقييم LEED هي مجموعات موضوعية تُنظم متطلبات LEED وفق أهداف استدامة محددة مثل <u>كفاءة الطاقة</u> و<u>استهلاك المياه وصحة المستخدمين</u>. هناك 9 فئات تقييم في نظام LEED v4.1.

IP	LT	SS	WE	EA	MR	EQ	IN	RP
Integrative Process	Location & Transportation	Sustainable Sites	Water Efficiency	Energy and Atmosphere	Materials & Resources	Indoor Environmental Quality	Innovation	Regional Priority
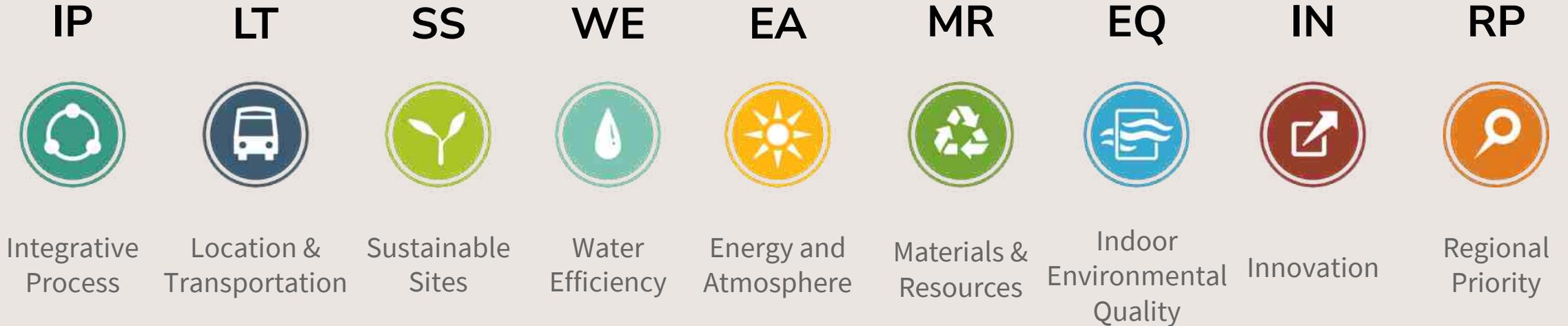
LEED CREDIT CATEGORIES

فئات تقييم LEED

متطلب أساسي (Prerequisite)	النقاط المحتملة للفئة	الرصيد (Credit)	التسمية العربية	الفئة (Credit Category)
	1	1	المنهجية التكاملية	Integrative Process (IP)
	حتى 16	8	الموقع ووسائل النقل	Location & Transportation (LT)
1	حتى 10	7	المواقع المستدامة	Sustainable Sites (SS)
3	حتى 11	7	كفاءة المياه	Water Efficiency (WE)
4	حتى 33	10	الطاقة والجو المحيط	Energy & Atmosphere (EA)
1	حتى 13	6	المواد والموارد	Materials & Resources (MR)
2	حتى 16	11	جودة البيئة الداخلية	Indoor Environmental Quality (EQ)
	حتى 6	2	الابتكار	Innovation (IN)
	حتى 4	1	الأولوية الإقليمية	Regional Priority (RP)

LEED v4.1 – Credit Categories Matrix

ANATOMY OF A LEED CREDIT

- Intent

- Requirements

- Documentation

- Calculations

- Referenced Standards

LEED CREDIT CATEGORIES

فئات تقييم LEED

Integrative Process (IP)   **المنهجية التكاملية**

IP

- Early collaboration
  التعاون المبكر

- Whole-systems thinking
  التفكير الشمولي للأنظمة

- Energy and Water Requirement analysis
  تحليل متطلبات الطاقة والمياه

Integrative Process

Exam tips:

- If the question mentions *early design*, *analysis* → think **IP**.

LEED CREDIT CATEGORIES

فئات تقييم LEED

Focus: Early collaboration & informed decision-making

What to understand (GA level):

- Sustainability works best when addressed **early (Predesign)**

- Decisions in early phases have the **largest impact** at the lowest cost

- Energy and water systems should be analyzed **together**, not in isolation

Typical concepts:

- Early energy analysis

- Early water analysis

- Cross-disciplinary teamwork

IP

Integrative Process

📌 **Exam logic:**

Earlier integration = better performance & lower lifecycle cost

Learning Objectives
•Conventional Process
•Integrative Process
•LEED / Green Building Charrette

Intent
Support **high-performance, cost-effective outcomes** through:
•Early analysis
•Collaboration
•Understanding interrelationships among building systems

9.1 Conventional Process (Linear Process)
Characteristics
•Sequential workflow
•Owner → Architect → Engineers → Contractors → Specialists
•Disciplines work in isolation
•Limited early collaboration
Limitations
•Missed system synergies
•Late-stage problem solving
•Higher cost for design changes
•Example: Architect may design orientation/envelope without HVAC input

9.2 Integrative Process
Characteristics
•Collaborative from early stage
•Whole-building / systems thinking
•All stakeholders involved early
  • Architect
  • Engineers
  • Contractor
  • Owner representative
  • Cost consultant
  • IAQ, HVAC, lighting, acoustics, fire, security specialists
Key Feature
•Team sets goals early through a **Green Building Charrette**

LEED / Green Building Charrette
Definition
An intensive workshop where project team members:
•Brainstorm
•Collaborate
•Establish sustainability goals
•Align performance targets
Purpose
Set measurable goals such as:
•40% energy reduction

•50% water reduction

Phases of Integrative Process
1. Discovery Phase (Pre-Design)
•Understand project requirements
•Explore system synergies
•Address budget and schedule
2. Design & Construction Phase (Schematic Design)
•Apply findings from discovery
•Whole-building approach
•Assess:
  • Orientation
  • Envelope
  • Window-to-wall ratio
  • Daylight
  • Thermal mass
  • Water sources (rainwater, greywater, condensate)
3. Operation & Performance Feedback (Occupancy)
•Measure performance
•Compare against goals
•Implement corrective actions
•Continuous monitoring of energy & water

Location & Transportation (LT)   الموقع ووسائل النقل

LT

❑ Access to public transport
الوصول للنقل العام

❑ Reduced vehicle dependence
تقليل الاعتماد على السيارات

❑ Walkability & connectivity
سهولة المشي والترابط

Location & Transportation

Exam tips:

• LT focuses on reducing emissions from transportation, not site aesthetics

• Many exam questions confuse LT with SS — look for **mobility and access** keywords.

Focus: Where the project is located and how people move

What to understand:

- Reduce car dependence
- Encourage access to:
    - Public transportation
    - Services
    - Walkable environments

Typical concepts:

- Urban infill
- Density
- Access to transit
- Reduced parking demand

Learning Objectives

At the end of this chapter, candidates will have an understanding of

- Sensitive land protection
- High priority site
- Surrounding density and diverse uses
- Access to quality transit
- Bicycle facilities
- Reduced parking footprint
- Green Vehicles
- LEED for Neighborhood Development location

The overall objective of this credit category is to:

- Reduce the environmental impact by proper site selection.
- Reduce the environmental impact associated with transportation.
- Improve public health by increased physical activity.

LT

Location & Transportation

📌 **Exam logic:**

Projects in dense, connected areas are environmentally preferable.

- Land is a precious resource

- Avoid using a farmland

- Priority for previously developed land

- Use existing infrastructure

- Higher density, vertical construction is preferred over low density, horizontal construction

- Density of project with services within ½ mile radius (800m).

- LEED encourages using a land close to basic services (market, restaurant, hospital, bank,...)
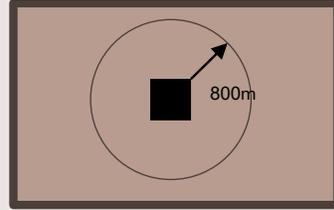
- الأرض هو مورد ثمين

- تجنب استخدام أرض بكر

- الأولوية للأراضي المطورة مسبقًا كي نتجنب استهلاك أراضي جديدة بكر

- الاستفادة من البنية التحتية الموجودة مسبقًا

- الأولوية لحصر البناء بشكل رأسي وتقليل البناء الأفقي لأن ذلك يستهلك مساحات أكبر من الأراضي

- كثافة الاستخدام بوجود خدمات قريبة (بحدود 800م).

- LEED يشجع على توفر خدمات قريبة من الموقع (متاجر، مطاعم، مستشفى، بنك،...)

LT

Location & Transportation

Location & Transportation (LT) – Key Credit Concepts (LEED v4.1)

◆ **Sensitive Land Protection**

الفكرة الأساسية:
تجنب تطوير المواقع البيئية الحساسة لتقليل الأثر البيئي.

يشمل:
•حماية الأراضي الطبيعية
•تجنب الموائل الحساسة
•تقليل فقدان النظم البيئية
📌 *يُفضّل البناء في مواقع مطوَّرة سابقًا بدل الأراضي البِكر.*

◆ **High Priority Site**

الفكرة الأساسية:
تشجيع التنمية في مواقع ذات أولوية اجتماعية أو بيئية.

أمثلة:
•**Brownfields** (مواقع ملوثة سابقًا)
• أحياء متدهورة أو محرومة (Disadvantaged neighborhoods)
•مواقع ذات قيود تطوير

الهدف:
• تقليل الضغط على Greenfields
•تجنب تطوير المناطق الحضرية

◆ **Surrounding Density & Diverse Uses**

الفكرة الأساسية:
تعزيز التنمية في مناطق ذات بنية تحتية قائمة وكثافة مناسبة.

يحقق:
•تحسين قابلية المشي
•تقليل الاعتماد على السيارات
•تقليل المسافات المقطوعة بالمركبات
•تحسين الصحة العامة

◆ **Access to Quality Transit**

الفكرة الأساسية:
تشجيع الوصول إلى وسائل نقل عامة عالية الجودة.

الفوائد:

• خفض انبعاثات الغازات الدفيئة
•تقليل تلوث الهواء
• تقليل الأضرار الصحية المرتبطة باستخدام السيارات

◆ **Bicycle Facilities**

الفكرة الأساسية:
تشجيع استخدام الدراجات كوسيلة نقل مستدامة.
•مواقف دراجات
•مرافق داعمة (دُش، خزائن)

◆ **Reduced Parking Footprint**

الفكرة الأساسية:
تقليل التأثير البيئي لمواقف السيارات.

يقلل من:
•الاعتماد على السيارات
•استهلاك الأراضي
•جريان مياه الأمطار السطحية

◆ **Green Vehicles**

الفكرة الأساسية:
تقليل التلوث عبر تشجيع المركبات النظيفة.

استراتيجيات نموذجية:
•مواقف مفضلة للمركبات منخفضة الانبعاثات
•محطات شحن/تزويد
• دعم carpool والمركبات الموفرة للطاقة

◆ **LEED for Neighborhood Development (ND) Location**

الفكرة الأساسية:
المواقع المعتمدة ضمن LEED ND تحقق تلقائيًا أهداف LT بشكل شامل.

يرتبط بـ:
•Smart Growth التنمية المدمجة
•سهولة المشي
•الاستخدام المختلط
•تقليل التمدد العمراني (Urban Sprawl)

78

Location & Transportation (LT)

LT

Important Terminologies

- **Impervious Surface**: Does not allow water infiltration (asphalt, concrete).
- **Permeable Surface**: Allows water infiltration.
- **SRI (Solar Reflectance Index)**: Measure of roof heat reflectivity.
- **Albedo**: Surface reflectivity.
- **Sky Glow**: Brightening of night sky due to artificial lighting.
- **Aquifer**: Underground water-bearing formation.
- **Bioswale**: Vegetated channel to manage stormwater.
- **Rain Garden**: Landscaped depression to capture runoff.
- **Eutrophication**: Nutrient pollution causing algae growth in water bodies.
- **Light Trespass**: Light falling outside intended area.

Location & Transportation

Sustainable Sites (SS)   المواقع المستدامة

SS

❑ Site protection

حماية الموقع

❑ Heat island reduction
تقليل الجزر الحرارية

❑ Stormwater management
إدارة مياه الأمطار

Sustainable Sites

❑ Light pollution control
الحد من التلوث الضوئي

Exam tips:

• SS addresses **what happens to the land** before, during, and after construction.
If soil, heat, rainwater, or lighting is mentioned → think **SS**.

LEED CREDIT CATEGORIES

Focus: Protecting and restoring the site itself

What to understand:
- Minimize site disturbance
- Manage stormwater
- Reduce heat island effect
- Protect ecosystems

Typical concepts:
- Previously developed land
- Erosion and sediment control
- Heat island reduction
- Light pollution reduction

📌 **Exam Logic:**
Minimize land disturbance, manage water resources responsibly, and protect the environment.

SS

Sustainable Sites

4.1 Construction Activity Pollution Prevention (Prerequisite)
Intent
- Reduce pollution from construction activities.

Key Focus
- Soil erosion control
- Sedimentation control
- Airborne dust control

Strategies
- Follow EPA Construction General Permit (or local equivalent).
- Install silt fences, sediment basins, stabilized construction entrances.
- Protect stormwater systems.
- Develop and implement Erosion & Sedimentation Control (ESC) Plan.

4.2 Site Assessment
Intent
- Assess site conditions before design.

Evaluate:
- Topography
- Hydrology
- Climate
- Vegetation
- Soils
- Human use
- Existing infrastructure

Goal
- Make informed, context-sensitive design decisions.

4.3 Open Space & Site Development – Protect/Restore Habitat
Intent
- Conserve natural areas.
- Restore ecological function.
- Provide outdoor space for occupants.

Strategies
- Protect native/adaptive vegetation.
- Restore previously developed areas with native plants.
- Provide accessible open space.
- Use vegetated areas for stormwater management.

4.4 Rainwater Management
Intent
- Reduce runoff volume and pollution.
- Mimic natural hydrology.

Strategies
- Reduce impervious surfaces.
- Use:
  - Rain gardens
  - Bioswales
  - Green roofs
  - Permeable pavements
  - Retention/detention ponds

- Harvest rainwater for reuse.

4.5 Heat Island Reduction
Intent
- Minimize microclimate effects on humans and wildlife.

Causes
- Dark roofs and pavements absorb heat.
- Lack of vegetation.

Strategies
- High SRI roofing materials.
- Vegetated roofs (green roofs).
- Shade from trees or structures.
- Reduce parking footprint.
- Open-grid paving.

4.6 Light Pollution Reduction
Intent
- Reduce sky glow.
- Improve nighttime visibility.
- Protect wildlife and human health.

Strategies
- Use full cut-off fixtures.
- Shield outdoor lighting.
- Limit uplight.
- Use motion sensors and timers.
- Comply with IES standards.

Water Efficiency (WE)

كفاءة المياه

WE

❑ Indoor water use reduction
تقليل استهلاك المياه الداخلية

❑ Outdoor water efficiency
كفاءة الري والمساحات الخارجية

❑ Metering & monitoring
القياس والمراقبة

Water Efficiency

Exam tips:

- WE focuses on **reducing potable water use**.
- Do not confuse WE with EA — fixtures and irrigation are water, not energy.

LEED CREDIT CATEGORIES

WE

Water Efficiency

Focus: Reducing potable water use
What to understand:
Indoor water reduction is
mandatory
- Efficient fixtures reduce:
  - o Water use
  - o Energy use (hot water)

Typical concepts:
- Low-flow fixtures
- Water-efficient landscaping
- Metering (conceptually)

📌 **Exam logic:**
Less potable water use = lower environmental impact.

Learning Objectives
•Outdoor water use reduction
•Indoor water use reduction
•Building-level water metering
•Cooling tower water use
•Water metering
• Efficiency firstly, Reduction secondly

Key Terminologies
•**Potable Water**: Drinkable water.
•**Blackwater**: Wastewater from toilets & urinals.
•**Greywater**: Wastewater from sinks, showers (no human waste).
•**GPM (Gallons per Minute)**: Flow rate for faucets, showers.
•**GPF (Gallons per Flush)**: Flush volume for toilets/urinals.
•**FTE (Full-Time Equivalent)**: Standard occupancy calculation.
•**WaterSense**: EPA certification for water-efficient fixtures.

WE

Water Efficiency

5.1 Water Efficiency – Landscaping (Outdoor Water Use)
Significance
•Landscape irrigation consumes large amounts of **potable water**.
Strategies
•Reduce or eliminate potable water for irrigation.
•Use:
- Native/adaptive plants
- Efficient irrigation systems
- Alternative water sources (rainwater, greywater)

5.2 Water Efficiency – Indoor
Significance
•Protect natural water resources.
•Reduce municipal water demand.
•Reduce sewage system load.
•Reduce energy use from water heating & pumping.
Key Concepts
Baseline Water Use
•Based on **EPAct 1992 fixture flow rates**.
•Calculated using standard occupancy (FTEs).
Design Case Water Use
•Calculated using proposed fixture flow rates.
•Compared against baseline to determine % reduction.
Required Reduction
•% reduction required (varies by rating system version).
•Indoor water reduction is often a **prerequisite**.

5.3 Cooling Tower Water Use
Strategies
•No once-through cooling.
•Use non-potable water if possible.
•Increase cycles of concentration.
•Submeter and monitor water consumption.

5.4 Building-Level Water Metering & Submetering
Intent
•Track water use.
•Identify leaks.
•Improve performance over time.
Requirements
•Install building-level meter.
•Submeter for:
- Indoor water
- Irrigation
- Cooling towers
•Share consumption data with USGBC (typically 5 years).

Reference Standards
•**EPAct 1992**
•Uniform Plumbing Code
•International Plumbing Code (IPC)

WE

Water Efficiency

LEED CREDIT CATEGORIES

فئات تقييم LEED

Energy & Atmosphere (EA)   **الطاقة والجو المحيط**

EA

❑ Optimize energy performance
  تحسين أداء الطاقة

❑ Commissioning
  الاختبارات التشغيلية

❑ Renewable energy
  الطاقة المتجددة

❑ Refrigerant management
  إدارة المبرّدات

Energy and Atmosphere

Exam tips:

• EA is the most heavily weighted category in LEED.
• For LEED GA, focus on intent and benefits, not calculations or modeling details.

LEED CREDIT CATEGORIES

Focus: Energy performance & emissions
(Highest weight in LEED)

What to understand:

- Energy efficiency is the **biggest environmental lever**

- Buildings consume large amounts of energy over their lifecycle

Typical concepts:

- Energy performance improvement

- Commissioning

- Renewable energy (conceptual)

- Refrigerant impact reduction

EA

Energy and Atmosphere

📌 **Exam logic:**

Better energy performance = fewer emissions & lower operating cost.

LEED CREDIT CATEGORIES

فئات تقييم LEED

Why Energy Matters in Buildings?
Buildings are the **largest consumers of energy**

Where Energy Is Used (Commercial Buildings – US Example)
1. Space Heating (largest portion)
2. Lighting
3. Cooling
4. Water Heating
5. Ventilation
6. Equipment & Plug Loads

EA

LEED Energy Framework – Overall Structure

◆ **Prerequisites (Mandatory)**
   • Fundamental Commissioning
   • Minimum Energy Performance
   • Building-Level Energy Metering
   • Fundamental Refrigerant Management

◆ **Credits (Optional – Earn Points)**
   • Optimize Energy Performance
   • Enhanced Commissioning
   • Building-level & Advanced Energy Metering
   • Demand Response
   • Renewable Energy
   • Enhanced Refrigerant Management
   • Green Power & Carbon Offsets

EA Prerequisite: <u>Minimum Energy Performance</u>

EA

❑ **Intent**
To reduce the environmental and economic harms associated with excessive energy use by achieving a **minimum level of energy efficiency** for the building and its systems.

❑ **Significance**
Energy use in buildings is a major contributor to climate change
- Air pollution
- Resource depletion (fossil fuels)
- Acid rain and smog

❑ **Strategies to Achieve Compliance**

1. Proper orientation of the building:

2. Optimized Building Envelope:
3. Efficient HVAC equipment & pumping system:

4. Efficient Lighting:

5. Passive technologies:
6. Efficient Controls:

7. Cogeneration / Combined Heat and Power

LEED CREDIT CATEGORIES

فئات تقييم LEED

Renewable Energy — Summary

Intent

Reduce the environmental and economic harms associated with <u>fossil fuel energy</u> by increasing the self-supply and use of renewable energy.

1. **Onsite Renewable Energy**
- Generated within project boundary
- Examples:
   o Solar PV
   o Solar water heating
   o Wind turbines
2. **Green Power & Carbon Offsets**
- Off-site renewable energy purchase
- Utility-based or REC-based
- Offsets conventional grid electricity

EA

Energy and Atmosphere

Refrigerant Management
Intent
•Reduce **stratospheric ozone depletion**
•Support compliance with the **Montreal Protocol**
•Minimize contribution to **climate change**

Evolution of Refrigerants
1. Natural Refrigerants
•Air, CO_2, H_2O, NH_3, hydrocarbons
•Pros: Low environmental impact
•Cons:
  o Poor refrigerant properties (air/CO_2/H_2O)
  o Toxic (ammonia)
  o Explosive (hydrocarbons)
2. CFCs (e.g., R11, R12)
•High **Ozone Depletion Potential (ODP)**
•Phased out under Montreal Protocol
3. HCFCs (e.g., R22, R123)
•Lower ODP than CFCs
•Still harmful
•Phase-out targeted by 2030

4. HFCs (e.g., R143, R407c, R410a)
•Zero ODP
•Have **Global Warming Potential (GWP)**
•Widely used in modern systems

LEED Requirements (Prerequisite)
New Buildings
•❌ No CFCs
Major Renovation
•❌ No CFCs OR
•Phase-out CFCs before project completion
Existing Buildings (O&M)
•No CFCs OR phase-out within 5 years
•If replacement is not feasible:
  o Provide third-party certification (payback >10 years)
  o Reduce CFC leakage rate to ≤5%
  o Follow **EPA Clean Air Act procedures**

EA

Energy and Atmosphere

6.4 Fundamental & Enhanced Commissioning
Intent (Fundamental)
•Ensure project meets **Owner's Project Requirements (OPR)**
•Cover:
- Energy
- Water
- Indoor Environmental Quality (IEQ)
- Durability

Intent (Enhanced)
•Further verify performance beyond fundamental requirements
•Improve long-term **operational performance**
Strategies
•Designate a **Commissioning Authority (CxA)**
•Commission at minimum:
- HVAC systems & controls
- Lighting & daylight controls
- Domestic hot water systems
- Renewable energy systems (e.g., wind, solar)

6.5 Building-Level & Advanced Metering
Intent (Building-Level)
•Support **energy management**
•Identify **additional energy-saving opportunities**
•Track **whole-building energy use**
Intent (Advanced Metering)
•Track **building-level AND system-level energy use**
•Enable better **energy performance analysis**
Strategies
•Install **building-level meters** for:
- Electricity
- Gas
- Chilled water

•Advanced metering system should:
- Provide **end-use energy distribution**
- Log data **hourly**
- Monitor **energy demand**

EA

Energy and Atmosphere

LEED CREDIT CATEGORIES

فئات تقييم LEED

Materials & Resources (MR)　　　　　**المواد والموارد**

MR

❑ Lifecycle thinking
التفكير في دورة الحياة

❑ Waste reduction
تقليل المخلفات

❑ Environmental and Health Product Declarations
شفافية مشاركة بيانات المنتج البيئية والصحية

Materials & Resources

Exam tips:

- MR is about where materials come from, how they are used, and how they are disposed of.
- Recycling alone is not the core concept — lifecycle is.

Focus: Lifecycle impact of materials

What to understand:

- Materials have impacts beyond construction:
    - Extraction
    - Manufacturing
    - Disposal

Typical concepts:

- Construction waste reduction
- Reuse & recycling
- Lifecycle thinking

MR

Materials & Resources

📌 **Exam logic:**

Reduce waste and choose materials with lower lifecycle impacts.

LEED CREDIT CATEGORIES

فئات تقييم LEED

Learning Objectives

- Storage of recyclable materials

- Construction Waste Management Planning & Implementation

- Building life cycle impact reduction

- Building product disclosure & optimization
  - Environmental product declarations
  - Sourcing raw materials
  - Material ingredients

the **3Rs waste hierarchy**

REUSE
REDUCE
RECYCLE

MR

Materials & Resources

LEED CREDIT CATEGORIES

فئات تقييم LEED

1 **Storage & Collection of Recyclables (Prerequisite)**

Intent

Provide accessible recycling collection for building occupants.

Significance

- Reduces landfill waste.

- Supports the 3Rs: **Reduce, Reuse, Recycle**.

- Conserves natural resources.

Strategies

- Provide dedicated recycling areas.

- Include common recyclables (paper, cardboard, glass, plastics, metals).

- Ensure convenient access for occupants and haulers.

MR

Materials & Resources

2 **Construction & Demolition Waste Management**

Intent
Reduce waste generated during construction and demolition.

Significance
- Diverts materials from landfills.
- Reduces environmental impacts from disposal.
- Encourages material recovery markets.

Strategies
- Develop a C&D waste management plan.
- Separate recyclable materials onsite.
- Work with certified waste haulers.
- Track diversion rates.

MR

Materials & Resources

3 | **Building Life-Cycle Impact Reduction**

Intent
Encourage reuse of existing structures and reduce environmental impacts.

Significance
- Minimize embodied energy.
- Reduces extraction and manufacturing impacts.
- Avoids demolition waste.

Strategies
- Maintain existing building structure/envelope.
- Adaptive reuse.
- Renovation instead of new construction.

MR

Materials & Resources

99

4

Materials with Recycled Content

Intent
Increase use of products containing recycled materials.

Significance
- Reduces virgin material extraction.
- Saves energy compared to producing new materials.

Strategies
- Specify products with pre- and post-consumer recycled content.
- Calculate recycled content by cost or weight.

Terminology
- **Pre-consumer recycled content**: Manufacturing waste reused.
- **Post-consumer recycled content**: Material used by consumers and recycled.
- **Assembly recycled content**: % of recycled material in product.

MR

Materials & Resources

5

Rapidly Renewable Materials

Intent
Promote materials that regenerate quickly.

Significance
- Reduces pressure on limited resources.
- Encourages agricultural-based materials.

Strategies
- Specify materials like bamboo, cork, wool, linoleum.

Terminology
- **Rapidly renewable**: Harvest cycle ≤ 10 years.

MR

Materials & Resources

LEED CREDIT CATEGORIES

6 **Regional Materials**

Intent
Reduce transportation impacts.

Significance
- Lowers fuel use and emissions.
- Supports local economy.

Strategies
- Source materials within 100 miles (160 km).

MR

Materials & Resources

7 **Certified Wood**

Intent
Promote responsible forest management.

Significance
- Prevents deforestation.
- Protects biodiversity.

Strategies
- Specify FSC-certified wood.

Terminology
- **FSC (Forest Stewardship Council)** certification.
- **Chain of Custody (CoC)**: Tracks wood from forest to product.

MR

Materials & Resources

8 · **Building Product Disclosure & Optimization**

Intent
Encourage transparency and environmentally preferable materials.

Significance
- Enables informed material selection.
- Reduces lifecycle environmental impacts.
- Protects human health.

Strategies
- Use products with:
  o **Environmental Product Declarations (EPDs)**
  o **Health Product Declarations (HPDs)**
  o **Corporate Sustainability Reports (CSR)**
- Select products optimized for lower impact.

Terminology
- **EPD**: Quantifies environmental impacts (e.g., global warming).
- **HPD**: Discloses chemical ingredients.
- **CSR**: Company sustainability reporting.
- **Optimization**: Selecting products with verified lower impacts.

MR

Materials & Resources

LEED CREDIT CATEGORIES

فئات تقييم LEED

9 **Low-Emitting Materials (Related to IEQ)**

Intent
Reduce indoor chemical contaminants.

Significance
- Improves indoor air quality.
- Protects occupant health.

Strategies
- Specify low-VOC adhesives, paints, flooring, furniture.
- Follow recognized standards (e.g., Green Seal, GREENGUARD).

MR

Materials & Resources

LEED CREDIT CATEGORIES

فئات تقييم LEED

Useful Terminology (Must Know for Exam)

Term	Meaning
Embodied Energy	Energy used to extract, manufacture, and transport materials
Cradle-to-Gate	From extraction to factory exit
Cradle-to-Site	From extraction to delivery onsite
Cradle-to-Cradle	Material continuously reused in closed loops
Source Reduction	Reducing material use at origin
Salvaged Materials	Recovered and reused materials
Refurbished Materials	Restored products
Sustainable Forestry	Responsible forest management

MR

Materials & Resources

Indoor Environmental Quality (EQ) جودة البيئة الداخلية

EQ

❑ Indoor air quality
جودة الهواء الداخلي

❑ Thermal comfort
التكيف الحراري

❑ Daylighting & views
الإضاءة الطبيعية

❑ Acoustics
الصوتيات

Indoor Environmental Quality

Exam tips:

• EQ is about people inside the building.
• If comfort, health, or occupants are mentioned → EQ is likely the answer.

LEED CREDIT CATEGORIES

فئات تقييم LEED

EQ

Focus: Health, comfort, and productivity

What to understand:

- Indoor environments affect occupants

- Comfort and air quality matter

Typical concepts:

- Ventilation

- Indoor air quality

- Thermal comfort

- Daylighting (conceptual)

Indoor Environmental Quality

📌 **Exam logic:**

Healthier indoor environments support well-being and productivity.

LEED CREDIT CATEGORIES

فئات تقييم LEED

Learning Objectives

1. Minimum indoor air quality performance
2. Environmental tobacco smoke control
3. Enhanced indoor air quality strategies
4. Low-emitting materials
5. IAQ Management During Construction
6. Indoor air quality assessment
7. Thermal comfort
8. Interior lighting
9. Daylight
10. Quality views
11. Acoustic performance

EQ

Indoor Environmental Quality

LEED CREDIT CATEGORIES

فئات تقييم LEED

What Constitutes the Indoor Environment?

❑ **Air Quality (IAQ)**
❑ **Thermal Comfort**
❑ **Lighting Quality**
❑ **Acoustics**

Why IEQ matters
- People spend ~90% of their time indoors
- Indoor air can be more polluted than outdoors
- Better IEQ → higher productivity, comfort, and reduced absenteeism

1 **Minimum Indoor Air Quality Performance (Prerequisite) Intent:**
Establish minimum ventilation to protect occupant health and well-being.

Core Requirement (conceptual):

- Ventilation design must comply with **ASHRAE 62.1** (ventilation standard).

Key Strategies (GA level):

- Provide required outdoor air rates
- Use **heat/energy recovery** to offset energy penalties
- Apply **Demand-Control Ventilation (DCV)** using CO_2 sensors
- Monitor and manage ventilation performance

📌 Note: Increasing ventilation improves IAQ but may increase energy use—balance via efficient systems.

EQ

Indoor Environmental Quality

LEED CREDIT CATEGORIES

فئات تقييم LEED

❑ **Heat/Energy Recovery (Concept)**

• Recovers energy from exhaust air
• Pre-cools/pre-heats incoming outdoor air
• Improves efficiency while maintaining ventilation

EQ
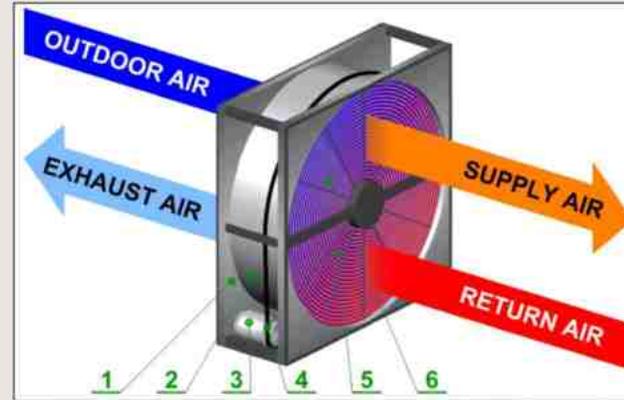
❑ **Demand-Control Ventilation (DCV)**

• Adjusts fresh air supply based on occupancy
• Uses CO_2 sensors to detect demand
• Reduces unnecessary ventilation energy
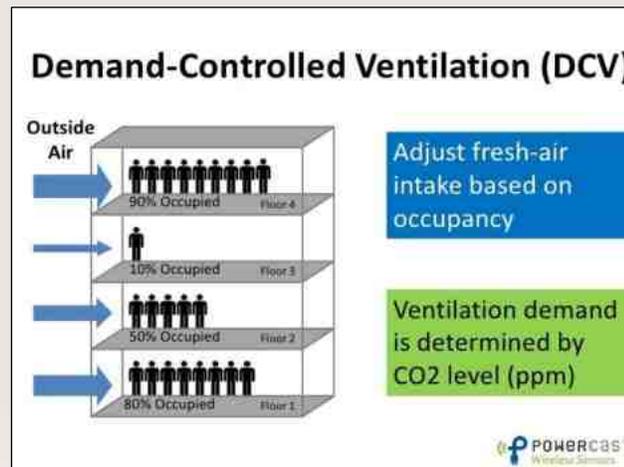
Indoor Environmental Quality

LEED CREDIT CATEGORIES

2 | **Environmental Tobacco Smoke (ETS) Control**

Intent: Protect occupants from secondhand smoke.

Strategies:

- No smoking inside buildings.
- Smoking areas must be located away from entries, windows, and air intakes.
- Residential projects require compartmentalization and air sealing.
- Protects occupant health and reduces exposure risks.

3 | **Enhanced Indoor Air Quality**

Intent: Improve IAQ beyond minimum standards.

Strategies:

- Entryway systems (walk-off mats).
- Exhaust contaminated spaces.
- Use high-efficiency (MERV-rated) filters.
- Protect HVAC systems.

EQ

Indoor Environmental Quality

LEED CREDIT CATEGORIES

4 **Low-Emitting Materials**
Intent: Reduce indoor chemical pollutants.
Applies to:
•Adhesives & sealants
•Paints & coatings
•Flooring
•Carpets
•Furniture
Key Concept: Limit VOC emissions to protect health.

5 **Indoor Air Quality Management During Construction**
Intent: Protect IAQ during construction/renovation.
Strategies:
•Develop IAQ Management Plan (SMACNA guidelines).
•Protect materials from contamination.
•Use MERV filters if air handlers are running.

EQ

Indoor Environmental Quality

6 **Indoor Air Quality Assessment**
Intent: Verify air quality before occupancy.
Options:
•Flush-out with outdoor air
•Air quality testing

EQ

7 **Thermal Comfort**
Intent: Ensure occupant comfort and productivity.
Standards:
•Comply with ASHRAE 55.
Strategies:
•Temperature and humidity control
•Individual occupant controls
•Thermal comfort survey

Indoor Environmental Quality

8 **Interior Lighting**
Intent: Provide high-quality lighting.
Strategies:
•Individual lighting controls
•Improve lighting quality
•Reduce glare

9 **Daylight & Quality Views**
Intent (Daylight): Reduce artificial lighting and connect occupants with outdoors.
Intent (Views): Improve well-being through visual connection.
Strategies:
•Optimize glazing orientation
•Shading devices
•Light shelves
•Control glare

10 **Acoustic Performance**
Intent: Improve speech privacy, learning, and comfort.
Strategies:
•Reduce HVAC noise
•Meet sound transmission and reverberation standards

EQ

Indoor Environmental Quality

Innovation (IN)   **الابتكار**

IN

Intent

To encourage projects to achieve **exceptional or innovative performance** to benefit human and environmental health and equity. To foster LEED expertise throughout building design, construction, and operation and collaboration toward project priorities.

❑   Exemplary performance
     أداء متميز

❑   New strategies
     حلول مبتكرة

Innovation

Exam tips:

- Innovation rewards going beyond standard credits.

LEED CREDIT CATEGORIES

فئات تقييم LEED

Focus: Going beyond standard credits

What to understand:

- Innovation rewards:
  - Exceptional performance
  - New strategies
  - Education & awareness

Typical concepts:

- Exemplary performance
- Innovative strategies
- LEED Accredited Professional (conceptually)

IN

Innovation

📌 **Exam logic:**

Innovation = doing more than the baseline requirements.

LEED CREDIT CATEGORIES

فئات تقييم LEED

Purpose: Reward exceptional or novel sustainability strategies beyond standard LEED requirements.

Ways to earn IN points:

1.Exemplary Performance

1. Exceed a credit's threshold (e.g., higher water/energy savings than required).

2.Pilot Credits

1. Use and help test emerging credits from the USGBC pilot library.

3.Innovative Strategy

1. Propose a quantifiable strategy not specifically addressed in LEED (must document intent, approach, and calculations).

4.LEED AP

1. +1 point if a principal team member is a LEED AP with the project's specialty (max 1 point).

Key notes (exam-safe):

•Innovation credits are **project-specific**.

•Must clearly document compliance in LEED Online.

•Using a "new product" alone ≠ innovation (must show measurable benefit).

IN

Innovation

LEED CREDIT CATEGORIES

فئات تقييم LEED

Regional Priority (RP)   الأولوية الإقليمية

RP

Intent

To provide an incentive for the achievement of credits that address **geographically specific environmental**, **social equity**, and **public health priorities**.

❏ Local environmental priorities
أولويات بيئية محلية

Regional Priority

Exam tips:

• Regional Priority reflects local environmental needs and varies by location.

LEED CREDIT CATEGORIES

فئات تقييم LEED

Focus: Local environmental priorities

What to understand:

- Environmental issues differ by location

- LEED rewards addressing **regional concerns**

Typical concepts:

- Water scarcity

- Energy demand

- Climate-specific priorities

📌 **Exam logic:**

Same credit, different importance depending on location.

RP

Regional Priority

LEED CREDIT CATEGORIES

فئات تقييم LEED

Purpose: Encourage credits that address **geographically specific environmental priorities**.
•Up to **4 bonus points** available.
•Credits vary by location (identified via USGBC RP lookup tool).
•Based on GIS and regional environmental concerns (e.g., water scarcity, heat, habitat loss).
Example regional priorities (varies by location):
•Renewable energy production
•Thermal comfort
•Reduced parking footprint
•Habitat protection
•Outdoor/Indoor water reduction
📌 Projects earn RP points by achieving selected priority credits for their region.

RP

Regional Priority

Key Elements of Project Surrounding & Public Outreach:

Purpose: To inform, involve, and build support for projects, including **housing** and **infrastructure**, by addressing **community needs**.

Techniques: Utilizing postcards, flyers, meetings, and interactive workshops (e.g., charrettes) to engage stakeholders.

Strategic Partners: Engaging **local community groups** to foster trust, ensure diverse representation, and reach underrepresented residents.

Sustainability & Design: Focusing on walkable, mixed-use developments, and sustainable infrastructure, such as **improved sidewalks** and **green energy**.

ND

Project Surrounding & Public Outreach

LEED Scorecard 0/110

INTEGRATIVE PROCESS	0 / 1	
LOCATION AND TRANSPORTATION	0 / 16	
SUSTAINABLE SITES	0 / 10	
WATER EFFICIENCY	0 / 11	
ENERGY & ATMOSPHERE	0 / 33	
MATERIALS & RESOURCES	0 / 13	
INDOOR ENVIRONMENTAL QUALITY	0 / 16	
INNOVATION	0 / 6	
REGIONAL PRIORITY CREDITS	0 / 4	

Rating systems vs Credit Categories

Credit Category	BD+C	ID+C	O+M	Homes	ND	Cities & Communities
IP	✓	✓	△	△	✓	✓
LT	✓	✓	✓	✓	✓✓	✓✓
SS	✓	△	✓	✓	✓✓	✓
WE	✓	✓	✓	✓	✓	✓
EA	✓	✓	✓✓	✓	△	✓
MR	✓	✓	✓	✓	✓	△
EQ	✓	✓✓	✓	✓	—	—
IN	✓	✓	✓	✓	✓	✓
RP	✓	✓	✓	✓	✓	✓

Legend

✓ = Fully applicable

△ = Applicable with adaptations

— = Not applicable or limited
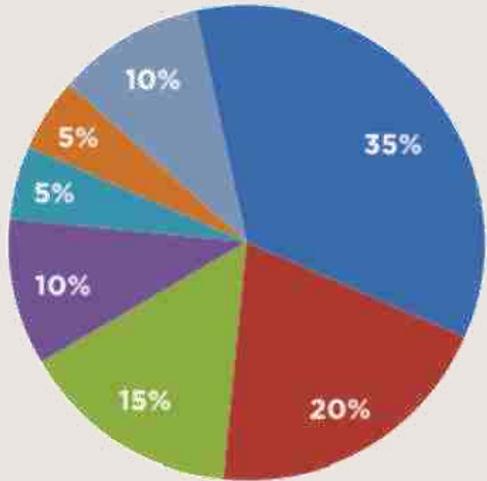
CERTIFICATION PROCESS
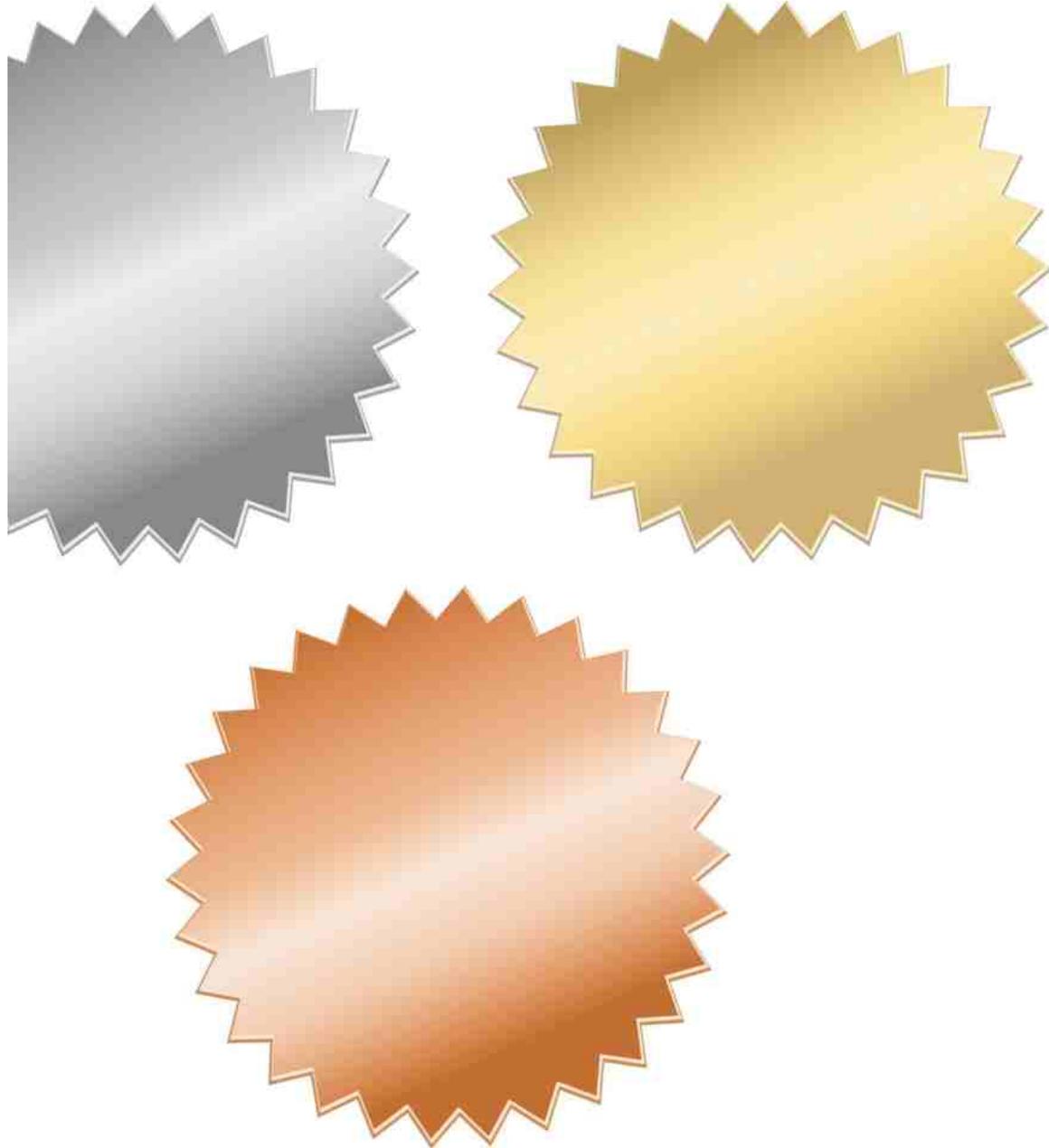
CERTIFICATION LEVELS: CERTIFIED, SILVER, GOLD, PLATINUM

Four Certification Levels

Projects earn certification levels: Certified, Silver, Gold, and Platinum based on points accumulated.

Points-Based System

Certification depends on points earned across multiple sustainability categories, encouraging comprehensive performance.

Platinum Level Excellence

Platinum represents the highest certification level, awarded for exceptional sustainability achievements.

LEED CERTIFICATION LEVELS

مستويات شهادة LEED

Certified: 40–49
معتمد

Silver: 50–59
فضي

Gold: 60–79
ذهبي

Platinum: 80+
بلاتيني

HOW ARE BUILDINGS CERTIFIED IN LEED?

كيف يتم اعتماد المباني في نظام LEED؟

For Projects in Progress

❑ Access LEED tools and resources to support project teams

❑ Use the LEED credit library to understand requirements

❑ Benefit from LEED education and training courses

للمشاريع قيد التنفيذ

Choose → Register → Earn Credits → Review → Certification → Performance Tracking (Arc)

Requirements for a Project to Achieve LEED Certification

A project must:
1 **Comply with Minimum Program Requirements (MPRs)**
•Meet basic eligibility criteria of the rating system
2 **Meet All Prerequisites**
•Prerequisites are mandatory
•No points are awarded for them
•If one prerequisite is not met → no certification
3 **Earn the Minimum Required Points**
•At least **40 points**
•Certification levels: Certified, Silver, Gold, Platinum

Credit Interpretation Request (CIR)

A **CIR** allows project teams to request official clarification about:

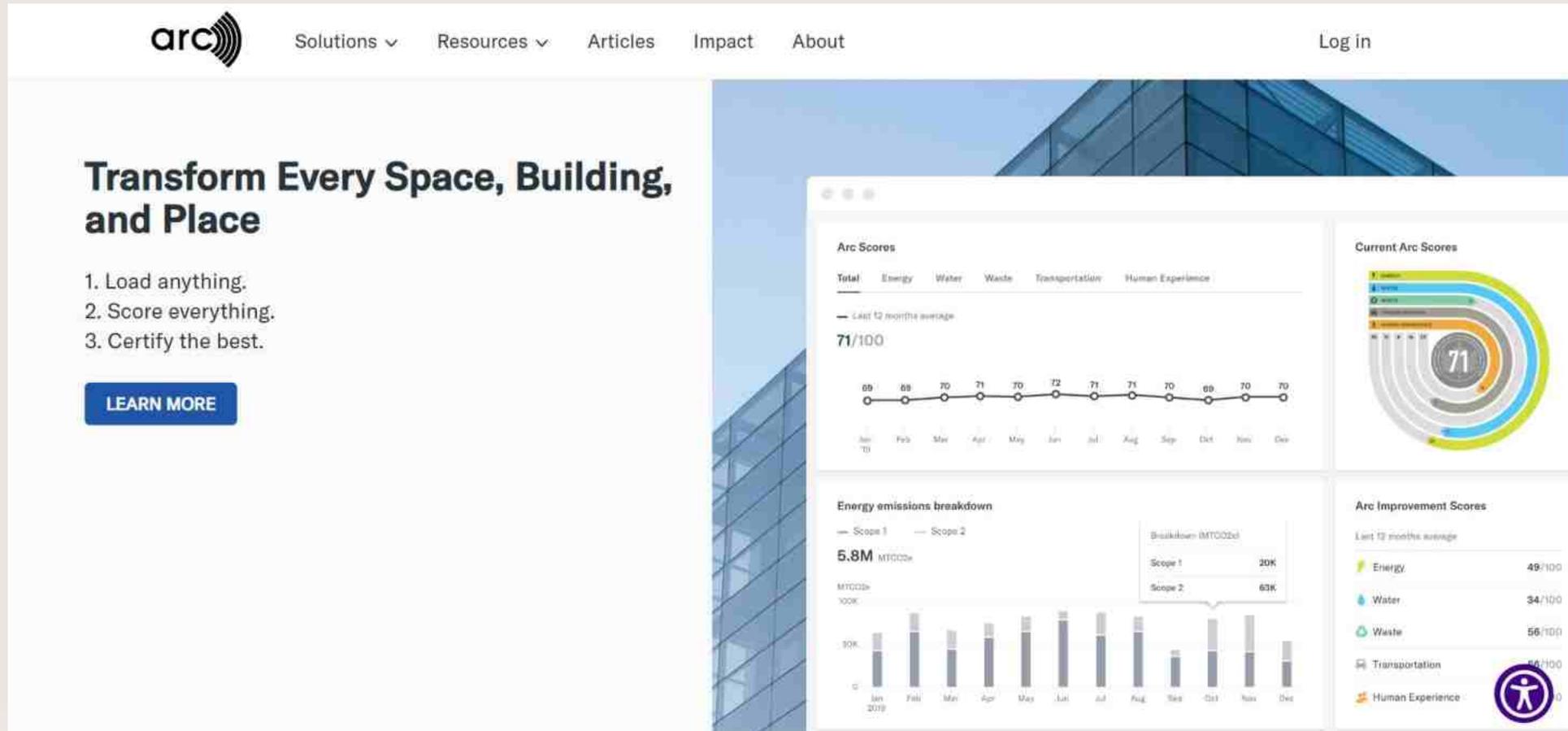•MPRs
•Prerequisites
•Credits
•LEED requirements

Key Points:
•Submitted through **LEED Online**
•Addresses only **one credit/prerequisite at a time**
•Must be under **600 words**
•No drawings/spec sheets required
•Cannot change credit requirements or thresholds
•Project-specific (for that project only)
•Fee applies (e.g., USD 220 per CIR)

ARC PLATFORM

منصة ARC

https://arc.gbci.org/

LEED v4.1 Residential: Multifamily Scorecard

INTEGRATIVE PROCESS		**1**
Credit	Integrative Process	1
LOCATION AND TRANSPORTATION		**15**
Credit	LEED for Neighborhood Development Location	15
Credit	Sensitive Land Protection	2
Credit	High-Priority Site	1
Credit	Surrounding Density and Diverse Uses	5
Credit	Access to Quality Transit	3
Credit	Bicycle Facilities	1
Credit	Reduced Parking Footprint	1
Credit	Electric Vehicles	2
SUSTAINABLE SITES		**10**
Prerequisite	Construction Activity Pollution Prevention	P
Credit	Site Assessment	1
Credit	Protect or Restore Habitat	1
Credit	Open Space	1
Credit	Rainwater Management	3
Credit	Heat Island Reduction	2
Credit	Light Pollution Reduction	1
WATER EFFICIENCY		**12**
Prerequisite	Water Use Reduction	P
Prerequisite	Building-Level Water Metering	P
Credit	Water Use Reduction	10
Credit	Water Metering	2
ENERGY AND ATMOSPHERE		**34**
Prerequisite	Fundamental Systems Testing and Verification	P
Prerequisite	Minimum Energy Performance	P
Prerequisite	Energy Metering	P
Prerequisite	Fundamental Refrigerant Management	P
Credit	Enhanced Commissioning	6
Credit	Optimize Energy Performance	18
Credit	Whole Building Energy Monitoring and Reporting	1
Credit	Grid Harmonization	2
Credit	Renewable Energy	5
Credit	Enhanced Refrigerant Management	1
Credit	Efficient Hot Water Distribution Systems	1
MATERIALS AND RESOURCES		**13**
Prerequisite	Storage and Collection of Recyclables	P
Prerequisite	Construction and Demolition Waste Management Planning	P
Credit	Building Life-Cycle Impact Reduction	5
Credit	Environmentally Preferable Products	6
Credit	Construction and Demolition Waste Management	2

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INDOOR ENVIRONMENTAL QUALITY		**16**
Prerequisite	Minimum Indoor Air Quality Performance	P
Prerequisite	Combustion Venting	P
Prerequisite	Garage Pollutant Protection	P
Prerequisite	Radon-Resistant Construction	P
Prerequisite	Interior Moisture Management	P
Prerequisite	Environmental Tobacco Smoke Control	P
Prerequisite	Compartmentalization	P
Credit	Enhanced Compartmentalization	1
Credit	No Environmental Tobacco Smoke	1
Credit	Enhanced Indoor Air Quality Strategies	4
Credit	Low-Emitting Materials	4
Credit	Indoor Air Quality Assessment	2
Credit	Thermal Comfort	1
Credit	Daylight and Quality Views	1
Credit	Acoustic Performance	2
INNOVATION		**6**
Credit	Innovation	5
Credit	LEED Accredited Professional	1
REGIONAL PRIORITY		**4**
Credit	Regional Priority	4
TOTAL POINTS		**110 POSSIBLE POINTS**

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STEPS AND DOCUMENTATION REQUIRED FOR PROJECT CERTIFICATION

Project Registration

The project must first be registered to initiate the certification process with the responsible body.

Documentation Submission

Submit detailed documentation of sustainable strategies implemented in the project for evaluation.

Third-Party Review

An independent third party reviews the submitted documentation to ensure compliance with certification standards.

Final Certification Decision

The certification institute makes the final decision to grant or deny certification based on the review.

LEED GREEN ASSOCIATE (GA): ELIGIBILITY AND EXAM STRUCTURE

Credential Accessibility

The LEED GA credential is accessible to professionals with a basic understanding of green building concepts.

Exam Content

The exam focuses on fundamental LEED concepts and green building processes without requiring prior experience.

LEED ACCREDITED PROFESSIONAL (AP): SPECIALIZATIONS AND REQUIREMENTS

Specialty Exam Requirement

LEED AP credential requires passing a specialty exam in areas like Building Design and Construction or Operations and Maintenance.

Prerequisite GA Credential

Candidates must possess the Green Associate (GA) credential before obtaining the LEED AP specialty certification.

Demonstrated Expertise

The AP credential reflects deeper knowledge and expertise in sustainable building practices and operations.

DIFFERENCES BETWEEN GA AND AP CREDENTIALS

GA Credential Overview

GA holders possess broad understanding of LEED, ideal for supporting project roles and general knowledge.

AP Credential Expertise

AP holders have deep, specialized expertise to lead and manage LEED certification projects effectively.

Module 3: **LEED GA Exam Digest**

Exam Duration	2 hrs
Questions	100 (MCQ)
Passing score	85% (170/200)

LEED® Process (16 Questions)

• <u>Organization fundamentals</u> (e.g. mission/vision; non-profit; role of USGBC®/GBCI)

• <u>Structure of LEED rating systems</u> (e.g., credit categories, prerequisites, credits and/or Minimum Program Requirements for LEED Certification)

• <u>Scope of each LEED rating system</u> (e.g., rating system selection; rating system families [BD+C, ID+C, O+M, ND, Homes])

• <u>LEED development process</u> (e.g., consensus-based; stakeholder and volunteer involvement; rating system updates/evolution)

• <u>Credit categories</u> (e.g., goals and objectives of each [LT, SS, WE, EA, MR, EQ, IN, RP]; synergies)

• <u>Impact categories</u> (e.g. what should a LEED project accomplish?)

• <u>LEED certification process</u> (e.g. certification levels [Certified, Silver, Gold, Platinum]; LEED Scorecard; 3rd party verification; role of documentation submission; LEED Interpretations; Addenda; awareness of different system versions [e.g., LEED Online]) Components of LEED Online and Project Registration

• <u>Other rating systems</u> – (e.g., in general, what other rating systems are out there?)

Integrative Strategies (8 Questions)

• <u>Integrative process</u> (e.g., early analysis of the interrelationships among systems; systems thinking; charettes)

• <u>Integrative project team members</u> (e.g., architect, engineer, landscape architect, civil engineer, contractor, facility manager, etc.)

• <u>Standards that support LEED</u> (e.g., breadth not depth of American Society of Heating, Refrigeration and Air-conditioning Engineers [ASHRAE]; Sheet Metal and Air Conditioning Contractors National Association [SMACNA] guidelines; Green Seal, ENERGY STAR®, HERs, Reference Standards listed in ACPs, etc.)

LEED GA Exam Structure

Location and Transportation (7 Questions)

• Site selection (e.g. targeting sites in previously developed and brownfields/high-priority designation area, avoiding sensitive habitat, located in areas with existing infrastructure and nearby uses, reduction in parking footprint)
• Alternative transportation (e.g., type, access, and quality; infrastructure and design)

Sustainable Sites (7 Questions)

• Site assessment (e.g., environmental assessment, human impact)

• Site design and development (e.g., construction activity pollution prevention; habitat conservation and restoration; exterior open space; rainwater management; exterior lighting; heat island reduction)

Water Efficiency (9 Questions)

• Outdoor water use (e.g., use of graywater/rainwater in irrigation; use of native and adaptive species)

• Indoor water use (e.g., concepts of low flow/waterless fixtures; water-efficient appliances; types and quality)

• Water performance management (e.g., measurement and monitoring)

LEED GA Exam Structure

Energy and Atmosphere (10 Questions)

• <u>Building loads</u> (e.g., building components, space usage [private office; individual space; shared multi-occupant spaces])
• <u>Energy efficiency</u> (e.g., basic concepts of design, operational energy efficiency, commissioning, energy auditing)
• Alternative and renewable energy practices (e.g., demand response, renewable energy, green power, carbon offsets)
• <u>Energy performance management</u> (e.g., energy use measurement and monitoring; building automation controls/advanced energy metering; operations and management; benchmarking; ENERGY STAR®)• Environmental concerns (e.g., sources and energy resources; greenhouse gases; global warming potential; resource depletion; ozone depletion)

Materials and Resources (9 Questions)

• <u>Reuse</u> (e.g., building reuse, material reuse, interior reuse, furniture reuse)
• <u>Life-cycle impacts</u> (e.g., concept of life-cycle assessment; material attributes; human and ecological health impacts; design for flexibility)
• <u>Waste</u> (e.g., construction and demolition; maintenance and renovation; operations and ongoing; waste management plan)
• <u>Purchasing and declarations</u> (e.g., purchasing policies and plans; environmental preferable purchasing (EPP); building product disclosure and optimization [i.e., raw materials sourcing; material ingredients; environmental product disclosure])

LEED GA Exam Structure

Indoor Environmental Quality (8 Questions)

• <u>Indoor air quality</u> (e.g., ventilation levels; tobacco smoke control; management of and improvements to indoor air quality; low-emitting materials; green cleaning)
• <u>Lighting</u> (e.g., electric lighting quality, daylight)
• <u>Sound</u> (e.g., acoustics)
• <u>Occupant comfort, health, and satisfaction</u> (e.g., controllability of systems, thermal comfort design, quality of views, assessment/survey)

Project Surroundings and Public Outreach (11 Questions)

• <u>Environmental impacts of the built environment</u> (e.g., energy and resource use inconvential buildings; necessity of green buildings; environmental externalities; triple bottom line)
• <u>Codes</u> (e.g., relationship between LEED® and codes [building, plumbing, electrical, mechanical, fire protection]; green building codes)
• <u>Values of sustainable design</u> (e.g., energy savings over time; healthier occupants; money-saving incentives; costs [hard costs, soft costs]; life-cycle)
• <u>Regional design</u> (e.g., regional green design and construction measures as appropriate, regional emphasis should be placed in Sustainable Sites and Materials & Resources)

1. What does LEED stand for?

A. Leadership in Energy and Environmental Development

B. Leadership in Environmental Engineering and Design

C. Leadership in Energy and Environmental Design

D. Leadership for Energy Efficiency and Design

2. Which organization develops the LEED rating systems?

A. GBCI

B. EPA

C. ASHRAE

D. USGBC

3. Who is responsible for reviewing projects and awarding

LEED certification?

A. USGBC

B. GBCI

C. EPA

D. WorldGBC

4. What is the maximum total number of points available in

LEED v4 / v4.1?

A. 100

B. 105

C. 110

D. 112

14
5

5. Which of the following best describes a LEED Credit?

A. A mandatory requirement

B. A professional qualification

C. A certification level

D. An optional requirement that earns points

6. What happens if a project fails to meet a prerequisite?

A. It earns fewer points

B. It can still be certified

C. It earns Innovation points

D. It cannot achieve LEED certification

7. Which LEED credit category has the highest point weighting?

A. Water Efficiency (WE)

B. Indoor Environmental Quality (EQ)

C. Materials & Resources (MR)

D. Energy & Atmosphere (EA)

8. What is the baseline water use for a water closet (WC)

in LEED?

A. 1.28 gpf

B. 1.6 gpf

C. 2.2 gpf

D. 0.5 gpm

9. Which step must occur before a project can be registered

in LEED Online?

A. Credit documentation

B. Certification review

C. Meeting Minimum Program Requirements (MPRs)

D. Final scorecard approval

10. Which statement best describes the Integrative Process (IP)?

A. A construction phase activity

B. A method for reducing costs only

C. Early collaboration and analysis to improve overall building performance

D. A requirement for commissioning systems

11. What is the baseline flush rate for a urinal in LEED?

A. 0.5 gpm

B. 1.28 gpf

C. 1.0 gpf

D. 2.5 gpm

12. **Which fixture is measured in gallons per minute (gpm)?**

A. Water closet

B. Urinal

C. Lavatory faucet

D. Toilet

13. Reducing parking capacity helps earn credits under which category?

A. SS

B. EA

C. LT

D. MR

14. Preferred parking spaces are commonly provided for which of the

following?

A. Construction vehicles

B. Emergency vehicles

C. Low-emitting and fuel-efficient vehicles

D. Visitors only

15. Building density for nonresidential projects is measured as:

A. Units per hectare

B. Population per site

C. Parking spaces per acre

D. Floor area per acre of buildable land

16. Which standard is referenced for ventilation requirements in LEED?

A. ASHRAE 90.1

B. ASHRAE 62.1

C. ISO 14001

D. ENERGY STAR

17. Radon is best described as:

A. A volatile organic compound

B. A construction material

C. A naturally occurring radioactive gas

D. A greenhouse gas

18. What is the primary purpose of commissioning?

A. Reduce construction cost

B. Maintain systems

C. Verify systems operate as intended

D. Replace equipment

19. What happens if a prerequisite is not met?

A. Fewer points are awarded

B. Innovation points can compensate

C. The project cannot be certified

D. Only Silver level is allowed

20. Which strategy supports carpooling in LEED?

A. Increasing parking capacity

B. Free parking for all users

C. Providing preferred parking for carpool vehicles

D. Adding more driveways

THANK YOU