

**المحاضرة التعريفية بعنوان المفاهيم الأساسية و استراتيجيات المباني  
الخضراء  
بالتعاون مع شركة ISG**

**إعداد**

**أ.د إبراهيم جواد كاظم آل يوسف**

**المهندسة شهد عبد العباس حمودي**

**تصميم الغلاف**

**د . بشار شامل كاظم**

المحاضرة التعريفية بعنوان المفاهيم الأساسية واستراتيجيات المباني الخضراء بالتعاون مع شركة ISG  
المنعقد في قسم هندسة العمارة - الجامعة التكنولوجية بتاريخ 2018/3/27

Yours Faithfully,

**Fadwa Al Hammami**  
Country Manager/ Iraq

Mobile Iraq: (+964) 07902556900  
Mobile: (+971) 0501785535  
E-mail: Fadwa@isg-fzllc.com

12th Floor, Al Odaid Office Tower, Airport Road  
Abu Dhabi, UAE.

P.O. Box: 500 5053  
Phone: (+971) 02-4146757

Global Offices:  
Dubai, Oman, Berlin, California, Johannesburg,  
Vienna



التي اقيمت في الجامعة التكنولوجية قسم الهندسة المعمارية



## هدف المحاضرة

عرض المعلومات الأساسية عن الاحتباس الحراري والتطوير المستدام والمباني الخضراء ونظام منح الشهادات المعتمدة

- تعريف المشاركين بالهيئات المانحة للشهادات الاستدامة المعتمدة عالمياً ونظام معايير LEED  
- شرح القيم الأساسية للمباني الخضراء وفوائد الخط الأساسي الثلاثي TRIPLE BOTTOM LINE

المكان قسم الهندسة المعمارية

وقت المحاضرة - ساعتان

المحاضر الدكتور المهندس هاني سالم مؤسس شركة INTEGRATIVE SUSTAINABLE

الجامعة التكنولوجية  
قسم هندسة العمارة

ISG

Integrative Sustainability Group , ISG

يسر قسم هندسة العمارة في الجامعة التكنولوجية بالتعاون مع شركة Integrative Sustainability Group , ISG دعوتكم لحضور المحاضرة التعريفية بعنوان:

### المفاهيم الأساسية واستراتيجيات المباني الخضراء

الاهداف

- عرض المعلومات الأساسية عن الاحتباس الحراري , و التطوير المستدام , و المباني الخضراء , ونظام منح الشهادات المعتمدة.
- تعريف المشاركين بالهيئات المانحة لشهادات الاستدامة المعتمدة عالمياً و نظام معايير LEED .
- شرح القيم الأساسية للمباني الخضراء وفوائد الخط الأساسي الثلاثي Triple Bottom Line .

المكان : قسم هندسة العمارة التاريخ: 27 آذار 2018 الساعة 10:30 صباحاً المدة : ساعتين

المحاضر : الدكتور المهندس هاني سالم مؤسس شركة Integrative Sustainable Group (ISG)

## Introduction

## المقدمة

**LEED: Leadership in Energy and Environmental Design Developed by the U.S. Green Building Council (USGBC)**

[www.usgbc.org](http://www.usgbc.org)

The LEED Green Associate credential is intended for professionals who want to demonstrate green building expertise in non-technical fields of practice.

The Green Building Certification Institute (GBCI) has created the LEED Green Associate Credential, Which denotes basic knowledge of green design, construction and operations.



## كلمة رئيس قسم هندسة العمارة :-



يوم الثلاثاء المصادف 2018/3/27

شهد العالم الكثير من التطورات والتغيرات في السنين الماضية بسبب زيادة أعداد السكان، وزيادة الاعتماد على المصادر الطبيعية وتطور التكنولوجيا الحياتية وما صاحبها من تطور في صناعة المباني لمواجهة متطلبات السكان، وأصبح العالم في حالة ترقب دائم من فناء الموارد (المواد والطاقة)، فحدثت الازمات الاقتصادية، وأصبحت المواد والطاقة هي أهم القضايا المرتبطة بالتغيرات المناخية وما يصاحبه من خلل بالمنظومات البيئية.

ورحب السيد رئيس قسم هندسة العمارة بالدكتور (هاني سالم) مدير مؤسسة (ISG) بمشاركته في اللقاء المحاضرة حول أهم أسباب ظهور المباني المستدامة وسبل التصدي للتغيرات البيئية ، وفي إمكانية استفادة الكادر التدريسي والطلبة من مساهمة هذه المؤسسة في تطوير معلوماتهم وفي خطوة تساهم في مشاركة من يرغب منهم في دورات واختبارات تؤدي إلى حصولهم على شهادات لتقييم مباني العمارة الخضراء معتمدة عالمياً.

## LEED Green Associate GA Exam Preparation

### Course Duration

2 days (16 hours)

### Course Overview

The built environment has a profound impact on our natural environment, economy, health, and productivity. Breakthroughs in building science, technology, and operations are now available to designers, builders, operators, and owners who want to build green and maximize both economic and environmental performance.

Through the LEED green building certification program, the U.S. Green Building Council (USGBC) is transforming the built environment. The green building movement offers an unprecedented opportunity to respond to the most important challenges of our time, including global climate change, dependence on non-sustainable and expensive sources of energy, and threats to human health. The work of innovative building professionals is a fundamental driving force in the green building moment. Such leadership is a critical component to achieving USGBC's mission of a sustainable built environment for all within a generation.

### Course Objectives

This course aims to meet the continuing education needs of professionals who are involved in the process of sitting in for the exam to become LEED Green Associates (LEED GA) in advance of becoming LEED Accredited professionals with specialty or for those who need further learning on the principals of LEED design. This program will also benefit government officials, architects, engineers and general public sectors who are interested in managing a LEED Certified Project on behalf of their organizations and who primarily act as owner representatives. On completion of the course, the learners will be able to:

- Present a working definition of the LEED Green Associate body of knowledge
- Understand the LEED GA requirements
- Understand the different categories of the LEED system
- Acquire the necessary knowledge, tips and study hints to pass the system

### Who Should Attend?

All industry professionals who are seeking to work on green building projects and more particularly those seeking to become LEED GA professionals and/or work on LEED 2014 project, including developers, building owners, client representatives, architects, engineers, contractors, consultants, environmental, health and safety managers, sustainability

### Course Content

#### Day One (6 Hours)

- Introductions
- Basics of Green Building
- Different Rating Systems, including local systems
- Exam Information
- Why Build Green? – Cost Benefit/Local Trends/Demand
- Basics of LEED BD&C Rating Guide – LEED AP Fundamentals / Green Associate
- LEED Location and transportation Prerequisites & Credits

- LEED Sustainable Sites Prerequisites & Credits
- LEED Water Prerequisite & Credits

#### Day Two (6 Hours)

- Recap
- Welcome
- LEED Energy Prerequisites
- Interactive Session
- LEED Energy Credits
- LEED Material Prerequisites & Credits
- LEED Indoor Environmental Quality Prerequisites & Credits

#### Day Three (6 Hours)

- Recap
- Welcome
- LEED Innovation Credits
- Project Management Tools
- Brief LEED Cost Analysis
- How LEED compares to the Abu Dhabi Urban Planning Council's Estidama program
- Interactive Session
- Sample Exam

## Greenhouse Gases

Atmospheric absorption and scattering at different wavelengths of electromagnetic waves .

The largest absorption band of carbon dioxide is in the infrared .

Greenhouse gases are those that can absorb and emit infrared radiation, but not radiation in or near the visible spectrum .

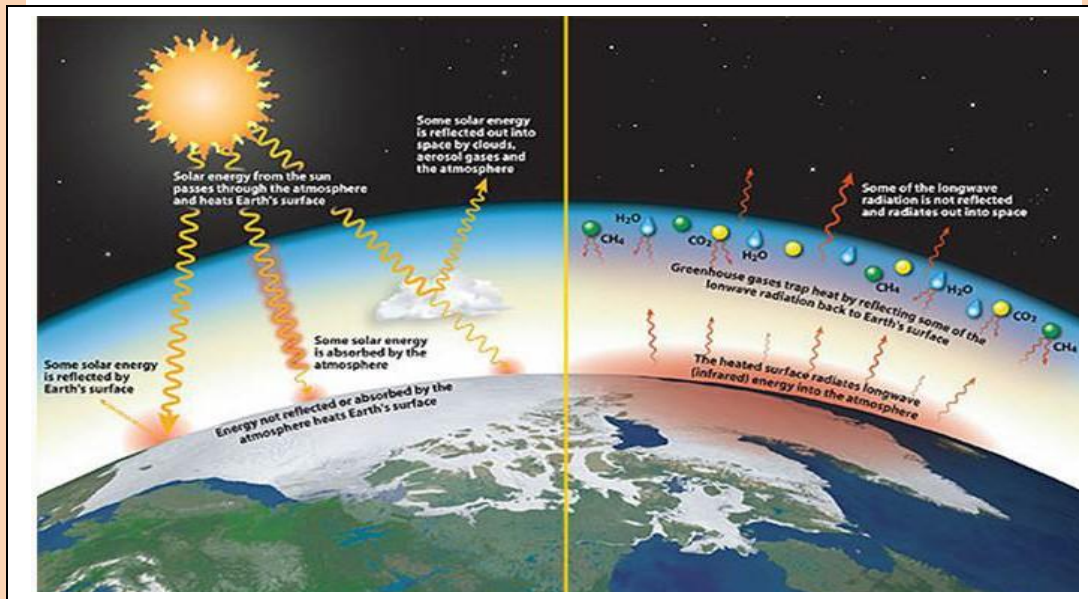
In order, the most abundant greenhouse gases in Earth's atmosphere are:

- Water vapor ( $H_2O$ )
- Carbon dioxide ( $CO_2$ )
- Methane ( $CH_4$ )
- Nitrous oxide ( $N_2O$ )
- Ozone ( $O_3$ )
- CFCs

Atmospheric concentrations of greenhouse gases are determined by the balance between sources (emissions of the gas from human activities and natural systems) and sinks (the removal of the gas from the atmosphere by conversion to a different chemical compound) .

The proportion of an emission remaining in the atmosphere after a specified time is the (AF) . More precisely, the annual AF is the ratio of the atmospheric increase in a given year to that year's total emissions.

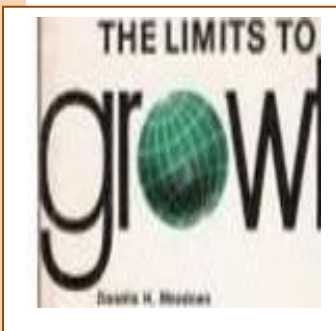
## Greenhouse Gas Effect



Hans Carl von Carlowitz , forestry I "Sylvicultura Oeconomic" 1703

"The Limits to Growth", report to the Club of Rome  
1972 Brundtland Report (WCED) "Our Common Future" 1987:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."  
(Generational Equity)



ENDA21



The Rio Declaration on Environment and Development, and the Statement of principles for the Sustainable Management of Forests were adopted by more than 178 Governments at the United Nations Conference on Environment and development {UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992.



The full implementation of Agenda 21, the Programme for Further Implementation of Agenda 21 and the Commitments to the Rio principles, were strongly reaffirmed at the World Summit on Sustainable Development {WSSD) held in Johannesburg, South Africa from 26 August to 4 September 2002

#### What are the characteristics of Green Buildings?

- The today major environmental challenges
- Climate change
- Depletion of resources
- Ozone depletion
- Land pollution
- Water Pollution
- Air Pollution
- There is a common perspective that industries are the major part of greenhouse gas emissions.

### What are the characteristics of Green Buildings?

- Reduced environmental impact throughout the lifecycle of the building
- Energy Efficient
- Water Efficient
- Provide better Indoor Environment & hence better living conditions
- Use environmental friendly or sustainable materials
- Produce Less waste
- Have lesser transportation requirement
- Protect/restore habitat





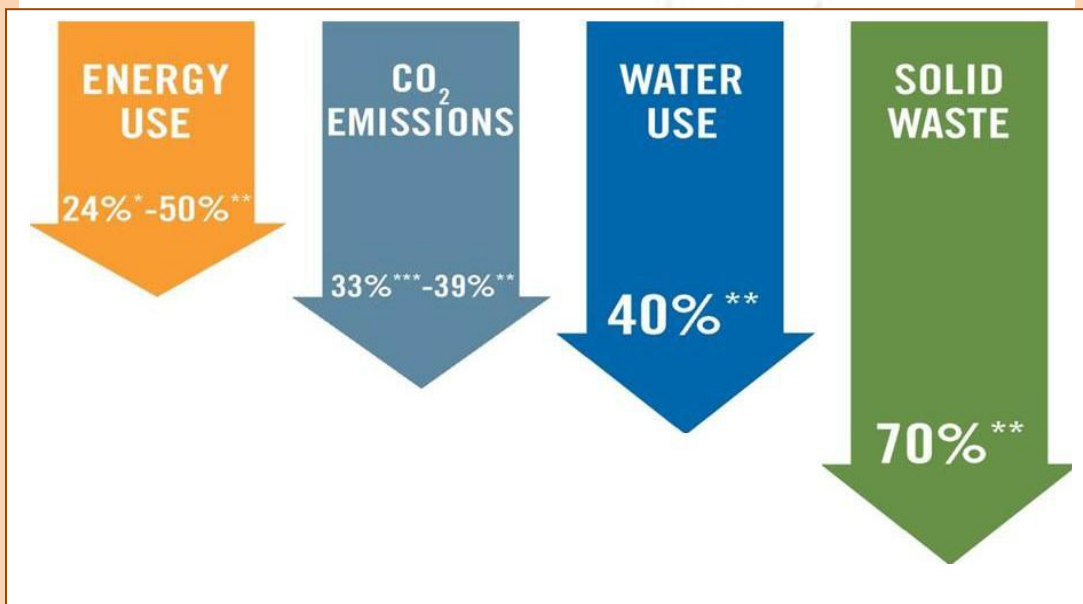


### list of various Green Building rating systems

- Australia: Green Star
- Brazil: AQUA/ LEED Brazil
- Canada :LEED Canada/ Green Globes
- China: GB Evaluation standard for green building
- Finland: Promise
- Germany: DGNB
- Hong Kong: HKBEAM
- India: GRIHA and LEED India
- United Arab Emirates: Pearl Rating System
- United States: LEED
- United Kingdom: BREEAM
- Taiwan: EEWB
- Qatar: GSAS

•greenstar

## Leadership in Energy & Environmental Design



*Green Buildings Can Reduce...*

## EXAM STRUCTURE

- Earning the LEED GA Credential requires passing a Two hour exam composed of 100 questions. (to Pass 170/ 200)
- Exam Content Areas

### -1Task Domains

- LEED Green Associate Tasks (100 %)

### -2Knowledge Domains

- LEED process {16 Questions•
- Integrative Strategies {8 Questions
- Location and Transportation {7 Questions.
- Sustainable sites {SS} {7 Questions.
- Water Efficiency {WE} {9 Questions
- Energy & Atmosphere (EA) {10 Questions
- Materials and Resources (MR) {9 Questions
- Indoor Environmental Quality (IEQ) {8 Questions
- Project Surroundings and Public Outreach {11 Questions

## LEED Green Associate examination information""

- Exam can be taken through prometric centers in any country.
- Exam Fee is USD 200 for members and USD 250 for non members
- Apply for exam through [www.usgbc.org](http://www.usgbc.org)
- Computer based test, 100 multiples choice questions.
- Total duration is 2 Hrs and 20 minutes
- (10 minutes tutorial on 10 minutes exit survey)
- interface+ 2 Hrs exam+
- Passing score 170/200- This doesn't mean 85 percentage. The evaluation is based on relative performance against baseline performance.
- No negative marking
- Results are available immediately after the exam

## Books & Guides

- LEED GA Study Guide.
- LEED Core concepts.
- LEED GA- Hand Book.
- <http://www.usgbc.org/resources/leed-v4-green-associate-candidate-handbook>.
- LEED v4 User Guide.
- <http://www.usgbc.org/resources/leed-v4-user-guide>
- LEED v4 Impact Category and Point Allocation Process Overview.
- <http://www.usgbc.org/resources/leed-v4-impact-category-and-point-allocation-process-overview>
- LEED v4 Building Design+ Construction Guide.
- <http://www.usgbc.org/guide/bdc>
- 1:1 The green building movement strives to create a Permanent shift in prevailing design, planning, construction, and operational practices.
  - With the aim of lower- impact, more sustainable, and ultimately regenerative built
  - Environment .

## Defining Green Buildings.

- 1:1 Efficiently using energy, water, land, and materials.
- 1:1 Protecting occupant health and improving employee productivity.
- 1:1 Reducing Waste and pollution from each green building.
- 1:1 Continuously Looking for ways to improve performance.

## Why Green Buildings are necessary?

- 1:1 Clearing of land for development destroys wildlife habitat.
- 1:1 Extracting, manufacturing, and transporting materials contribute to pollution of water and air and

## release of greenhouse gases.

l:l Building operations require large inputs of energy and water and generate substantial waste streams.

l:l Building- related transportation, such as commuting and services, contributes to wide range of vehicle energy consumption.

## Building resources and energy consumption:

### Energy

- %72 of electricity consumption.
- %24 to 50% of energy use.
- %38 of all carbon dioxide (CO<sub>2</sub>) emissions.
- %40 of raw materials use.
- %30 of waste output (136 million tons annually).
- %14 of potable water consumption.

### Electricity

28

### Water

l:l Modifying the conventional way in which buildings are designed can reduce the resource consumption.

l:l Green Buildings are efficient and comfortable.

l:l They contain the amenities needed for better Quality of life like better health.

l:l The value of green buildings construction is increased in recent years.

l:l Also the demand for skilled professionals have increased.

• U. S General services Administration requires that all new federal government construction projects and sustainable renovations achieve LEED certification.

- It requires a minimum to achieve at least GOLD rating (before 2010 it was silver).
- For such projects Government agencies, utility companies and manufactures increasingly offer incentives for owners and developers.

### Energy Usage in buildings:

- ! Buildings are exceptionally costly investment.
- ! Owners must have access to large amounts of capital and sufficient revenue for operations and maintenance costs.
- ! As per Energy Information Administration (EIA) U. S Households spent a total \$201 billion on energy in 2005.

- ! In 2001 Americans consumed 133 billion gallons of gasoline spending \$150.3 billion on fuel.
- ! Consumption of that fuel released 837 million metric tons of CO<sub>2</sub>.
- ! Today the built environment contributes 67% of all greenhouse gas emissions.

### Life Cycle of Built Environment

- Q Sustainability is a process of continual improvement.
- Q Sustainability begins at the inception of an idea and continues seamless until the project reaches the end of its life and the parts are recycled or reused.
- Q The life cycle assessments, encompasses planning, design, construction, operations and ultimately

### retirement and renewal.

### Life Cycle of Built Environment

- ! Sustainable design requires consideration of the entire life of a building.
- ! Life cycle cost analyses permit a comparison of different designs and identify the best long-term investment approach.
- ! It Allows for a balance between initial costs and costs occurred during operations and at the end of life.

### Life Cycle of Built Environment

#### Various types of building costs associated with buildings are:

- ! Initial costs- Design & Construction.
- ! Operation costs- Energy, water, Utilities and personnel.
- ! Maintenance Costs.
- ! Replacement Costs.

Lifecycle analysis identifies which high performance buildingsystems will save money over the life of the project, despite their higher initial costs.  
Thus is allows owner to invest in long- term performance.

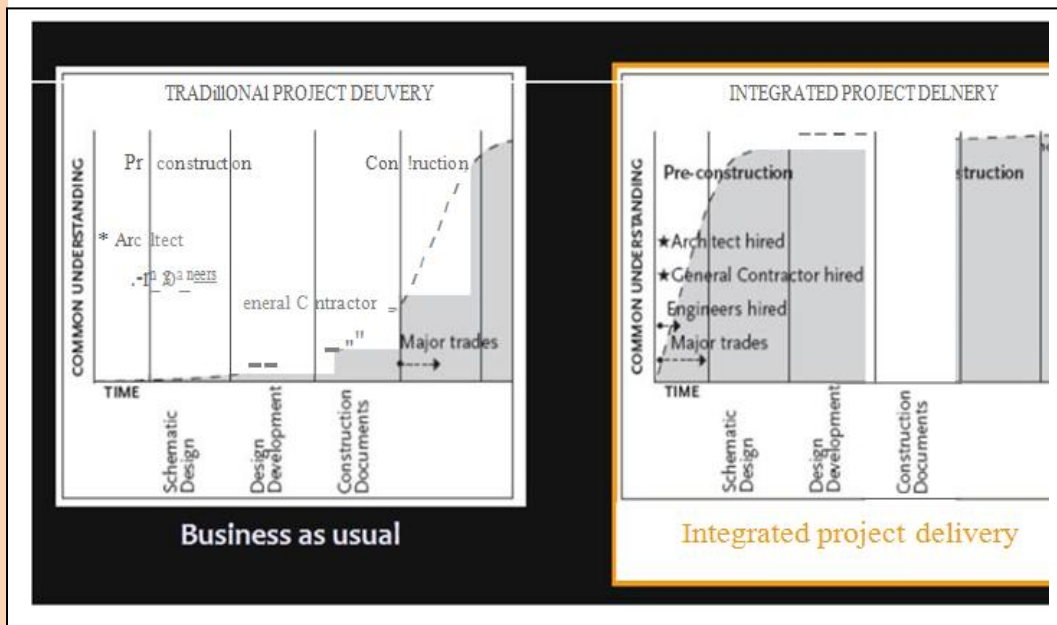
## Integrative approach

**Conventional Design:** The architect, the engineers (Civil, Mechanical, electrical, plumbing, structural), the landscape architect, the construction contractors work independently on their individual scopes of work.

- This separation of disciplines and generally linear design process can limit opportunities for

integration.

- In this approach they come together only towards the end.



1:1 In an integrative process, the property owner, facility managers, designers, construction contractors, and other project team members establish a mutual understanding.

1:1 And set project goals, priorities, and budget as early as

possible.

### Energy

1:1 Many of the decisions related with environment impacts are made early in the design process.

1:1 It will start with the location of the site.



### Example: Impacts of Site Selection on natural environment

- Walk able distance to public transit or shops and services can reduce transportation related energy.
- Building orientation can increase the availability of natural daylight, which will reduce demand for artificial lighting.

## Green Building Costs and Benefits

- l:l %13 Lower maintenance cost.
- l:l %26 less energy usage.
- l:l %27 higher levels of occupant satisfaction.
- l:l %33 lower CO<sub>2</sub> emissions.

## Indoor Environment Quality

- l:l Environmental Protection Agency (EPA) found that people in the U. S spend on average 90% of their time indoors.
- l:l Within indoor environment the occupants may be exposed to pollutants concentration two 100 times higher than outdoor levels.
- l:l Occupants of green buildings typically have higher satisfaction with air quality and lighting as

**compared to conventional buildings.**

**Did you know...?**

Indoor air is more polluted than outdoor air. Carpet, paint, particle board, detergents, printer inks, and other household items all release chemicals. Houseplants filter the air and remove toxins. Five top air cleaning plants are:

- Spathiphyllum (Peace Lily)
- Chlorophytum comosum (Spider Plant)
- Epipremnum aureum (Devil's Ivy)
- Syngonium podophyllum (Arrowhead Plant)
- Hedera helix (English Ivy)

## Green building Cost

1:1 One survey concluded that respondents believed that green building features 17% to the cost of building.

1:1 Whereas survey of 4 green buildings found that on actual average cost was 2%.

1:1 If we consider overall cost it will be balanced by long term benefits. E.G Installing high performance Windows will lower HVAC costs.

1:1 The researchers found that on average certified green office buildings rent 2% more than comparable nearby buildings

## U. S. Green Building Council &

### Its Programs

1:1 USBC is a nonprofit organizations whose members represent more than 15,000 organizations across the industry.

1:1 Members represent building owners, real state developers, facility managers, architects, designers etc.

1:1 USGBC provides educational opportunities to learn more about sustainable design strategies.

## Mission

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

- Advocacy
- Resources.
- Education.
- Committees, Chapters, and conferences.
- Conferences.

## Leadership in Energy and Environmental Designs (LEED) IJS G

LEED Rating system was created by USGBC to provide a framework for meeting sustainability goals.

LEED addresses all types of buildings.

LEED promotes a whole-building approach to sustainability by recognizing performance in: Integrative Approach.

- Location and Planning.
- Sustainable site development.
- Water Savings.
- Energy efficiency.
- Material Selection.
- Indoor environmental quality.
- Innovative strategies.

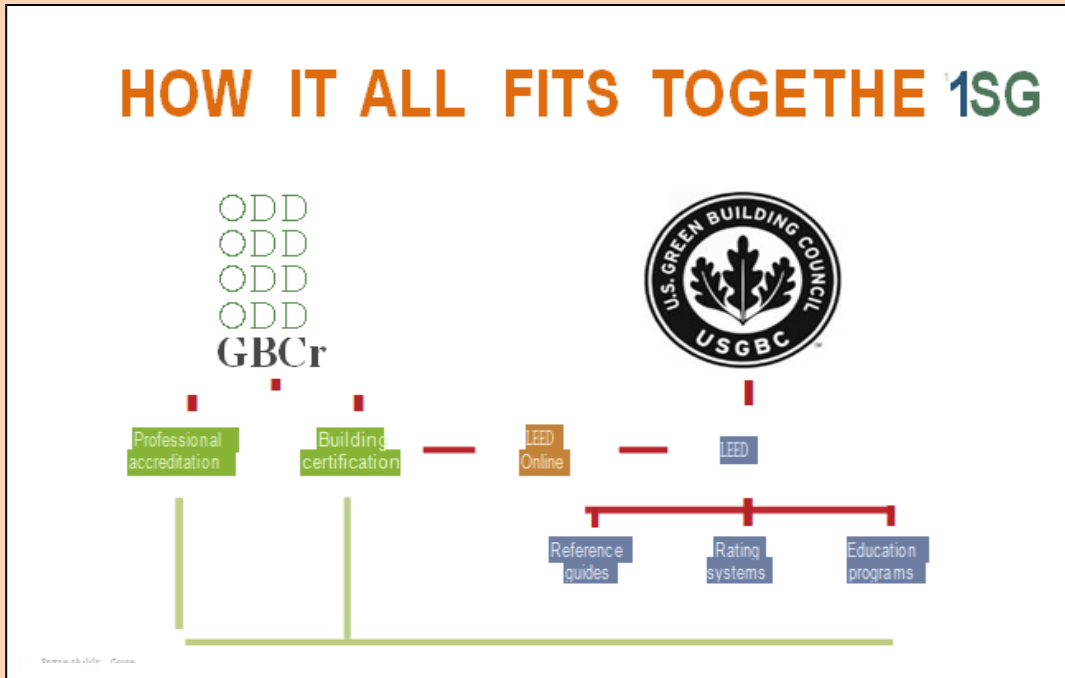
## Leadership in Energy and Environmental Design (LEED) IJS G

LEED measures and enhances the design and sustainability of buildings based on 'triple bottom

## Green Building Certification Institute (GBCI)

- GBCI administers credentialing programs related to green building practice.
- GBCI Administers The LEED Professional Accreditation program independently. Difference between USGBC & GBCI (Pg. No. 23).
- Three levels of Accreditation available:
- LEED Green Associate.
- LEED Accredited Professional.
- LEED Fellow.
- Refer Pg. No. 39, 40, Guide.

## HOW IT ALL FITS TOGETHER 1SG



### LEED Rating Systems

- LEED Rating system are tools for encouraging, evaluating, and green buildings and neighborhoods, with the ultimate goal of market transformation.
- New constructions, the ongoing operations and maintenance of an existing building are all addressed by LEED rating systems.
- The rating systems respond to new t The LEED rating System addresses various project types:

### The LEED rating System addresses various project types:

- LEED BD + C Building Design+ Construction applies to buildings that are being newly constructed or going through a major renovation.
- LEED ID + C interior Design+ Construction applies to projects that are complete interior lit-out.
- LEED O + M Building operations+ Maintenance applies to existing buildings that are undergoing improvement work or little to no construction.

- 
- LEED ND Neighborhood Development applies to new land development projects or redevelopment projects containing residential uses, nonresidential uses, or a mix. Projects can be at any stage of the development process, from conceptual planning to construction .
- ./ Multiple Certifications for the Same Building: Projects are not limited to just one rating system, A Building
- could earn LEED BD + C: Core & Shell. LEED 0 + M: Existing Buildings.
- ./ For Each Rating systems reference guides have been developed to aid in the, implementation and under standing of specific rating systems.echnologies and policies to changes in built environment.

### **LEEDBD + C:**

- LEED BD + C New Construction & Major Renovation.
- LEED BD + C Core & Shell.
- LEED for Commercial Interiors.
- LEED BD + C Schools.
- LEED BD + C Retail.
- LEED BD + C Hospitality.
- LEED BD + C Data Centers.
- LEED BD + C Warehouses & Distribution Centers.
- LEED BD + C Healthcare.
- LEED BD + C Homes & Multifamily (1to 3 stories).
- LEED BD + C Multifamily Midrise (4 to 8 Stories).

### **Green Building Strategies**

- Additional Strategies tor Neighborhood development:
- l:l Smart Location and Linkage.
- l:l Neighborhood Pattern and Design.
- l:l Green Infrastructure & Buildings

## What Projects are Eligible for LEED?

**A Project must adhere to the LEED Minimum Program Requirements (MPRs).**

**1:1 Must Comply with Environmental Laws:**

- ../ New Construction, Core & Shell, School, Commercial Interiors.
- ../ Project Must comply with all the Federal and Local Environmental Laws & Regulations.
- ../ Existing Buildings: Operations & Maintenance .
- ../ Normal Building operations must also comply with all the Federal and Local Environmental Laws &

## Regulations.

**:1 Must be a Complete, Permanent Building or Space All rating Systems•**

- ../ Must be constructed on a Permanent location on already existing land. No moving of building allowed.
- ../ New Construction, Core & Shell, Schools:
- ../ Must include new design and construction of at least one full building.
- ../ Commercial interiors:
- ../ LEED project scope has to be distinct from all other buildingspaces .
- ../ Existing Buildings:
- ../ Must include at least one existing building in its entirety.

## MPRs

**1:1 Must be a Complete, Permanent Building or Space All rating Systems•**

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- ../ Commercial interiors:
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- ../ Existing Buildings:
- ../ Must include at least one existing building in its entirety.

## **1:1 Must Comply with Minimum Floor Area Requirement •**

- ../ New Construction & Major Renovation, Core & Shell, Schools, existing Buildings:
- ../ Operations & Maintenance:
- ../ Must have 1000 square feet (93 sqm) of gross floor area .
- ../ Commercial interiors:
- ../ Must have at least 250 square feet (22 sqm) of gross floor area.

## **1:1 Must Comply with minimum Occupancy Rates.**

- ../ New Construction & Major Renovation, Core & Shell, Schools, Commercial Interiors.
- ../ Must serve one or more Full Time Equivalent (FTE).
- ../ Existing Buildings: Operations & Maintenance:
- ../ Must be in the state of physical occupancy and buildingsystems must be working to serve the occupants.

## **1:1 Must Comply with minimum Building Area to site Area Ratio.**

All Rating systems:

- ../ Gross Floor areas must not be less than 2% of the gross land area within the LEED project boundary

1:1 Must Comply with environmental law all rating systems:

- ../ Must comply with applicable federal, state, and local building- related environmental laws and regulations in place where the project is located.
- ../

A lapse in a project's compliance with building- related environmental law or regulation that results from an unforeseen and unavoidable circumstance shall not necessarily result in non-compliance with this MPR.

## Prerequisites and Credits

Rating system consists of prerequisites & Credits:

**I:I Prerequisites are required elements: Green Buildings strategies that must be included in any LEED- Certified Project.**

**I:I Credits are Optional Elements: Strategies that project can select to pursue to gain towards LEED certification.**

**I:I Prerequisites are required to achieve certification. One of the first steps on any LEED project is to make sure the project can meet the prerequisites. If the project cannot meet the prerequisites, the building cannot earn LEED certification.**

**I:I Make sure your project can meet the prerequisites before you start down the path of certification.**

The details about the requirements for each credit are covered in the more advanced courses rather than this fundamental course on the LEED credits categories.

## Prerequisites and Credits

**I:I LEED rating systems generally have 100 base point.**

**I:I Plus 6 points for innovation in Design Points.**

**I:I Plus 4 Regional Priority Points.**

**I:I Total there are 110 Points.**

## Perquisite & Credit

**I:I Each prerequisite and credit has an "Intent" which identifies the prerequisites or credits main sustainability goal or benefit.**

**I:I Each prerequisite & Credit in LEED contains the following:**

- Requirements.
- Behind the intent.
- Credit tips.
- Referenced standards .
- Step- by- Step Guidance.
- Exemplary performance .
- Calculations .
- Required Documentation .

- **Certification Levels**
- **Certified 40-49 Points.**
- **Silver 50-59 Points.**
- **Gold 60-79 Points.**
- **Platinum 80 +Points**



INTEGRATIVE  
SUSTAINABILITY  
GROUP

ISG



Corporate Office: 17, The Indium Building, Umm Suqaybi Road, Al Barsha, Dubai, United Arab Emirates.  
P.O.Box: 05053, Dubai, UAE. / Phone: (+971) 4 3873 4242 / E-mail: info@isq-tz-uc.com  
Global Offices: Berlin, Germany, Jeddah, Saudi Arabia, Doha, Qatar, Muscat, Oman



