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HIGH-PERFORMANCE BUILDING DESIGN PROFESSIONAL - HBDP EXAM REFRESHER

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ONLINE TRAINING BY KRISHNAJI PAWAR

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MODULE

5

Sustainable Buildings

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BUILDING DESIGN
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Sustainable buildings, also known as green buildings, are environmentally responsible structures designed to minimize environmental impact while maximizing occupant health and well-being.

Learning Objectives

- Introduction to High Performance Buildings
- Sustainability Concepts
- What is sustainable development?
- Sustainable Development: Definitions and Applications
- **Sustainable Buildings**
- Sustainable Transportation
- Alternative Energy & Carbon Reduction
- Environmental Improvement Programs and Rating Systems
- HVAC Processes



INTRODUCTION

- Sustainable buildings are designed to minimize environmental impact while maximizing efficiency, durability, and performance.
- Key aspects include energy efficiency, water conservation, and materials selection.
- Energy-efficient appliances, lighting, heating, and cooling systems are used to reduce energy consumption.
- Water conservation is achieved through low-flow fixtures, rainwater harvesting systems, and drought-resistant landscaping.
- Materials selection includes recycled steel, reclaimed wood, and low-VOC paints and finishes.
- Indoor environmental quality is also a focus, with features like ample natural light, good ventilation, and non-toxic building materials.
- Sustainable buildings represent a holistic approach to building design, considering the well-being of occupants and the community.

SUSTAINABLE BUILDINGS OVERVIEW



- Sustainable buildings are environmentally responsible structures designed to minimize environmental impact while maximizing occupant health.
- Key aspects include energy efficiency, water conservation, and materials selection.
- Energy-efficient design elements include high-performance insulation, energy-efficient windows, and efficient heating and cooling systems.
- Water conservation is achieved through low-flow toilets, rainwater harvesting systems, and drought-tolerant landscaping.
- Materials selection includes environmentally friendly materials like recycled content, reclaimed wood, and low-emission paints and finishes.
- Other green design elements include passive solar design, green roofs, and daylighting.
- Sustainable buildings contribute to a more sustainable future by reducing energy and water consumption, minimizing waste, and creating a healthier indoor environment.
- As demand for sustainable buildings grows, architects, builders, and policymakers must prioritize sustainability in all aspects of building design and construction.

LAND DEVELOPMENT PRACTICES

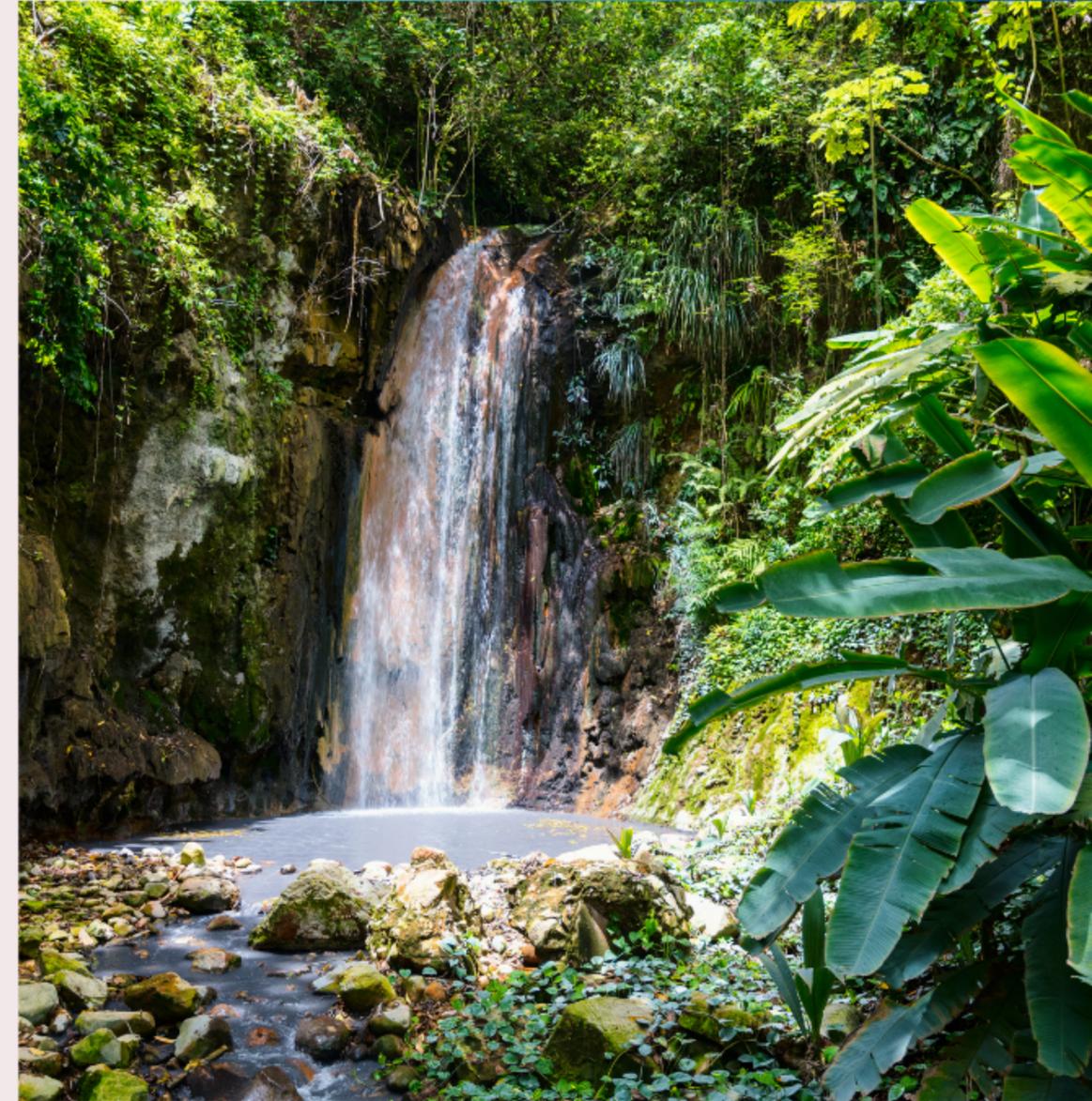
- Transforming raw land into developed areas for residential, commercial, industrial, or recreational purposes.
- Involves a complex interplay of legal, engineering, environmental, and planning considerations.
- Land use planning: Determines the most appropriate use of land based on zoning regulations, environmental impacts, and community needs.
- Site analysis and design: Assesses the physical characteristics of the land to determine the best layout for development.
- Environmental considerations: Conducts environmental assessments to identify potential impacts on wetlands, wildlife habitats, or water quality. Mitigation measures may be required.



LAND DEVELOPMENT PRACTICES +



- Infrastructure development: Involves the construction of roads, utilities, and other necessary infrastructure. Developers work closely with local governments and utility providers to ensure necessary infrastructure is in place.
- Legal considerations: Obtains permits and approvals from local authorities. Developers must navigate a complex web of regulations and requirements.
- Successful land development practices require a multidisciplinary approach that balances environmental, social, and economic considerations.
- Example: Developers must conduct thorough site analysis before construction to understand topography, soil conditions, and environmental features.
- Construction process: Building roads, installing utilities, and constructing homes according to the site plan. Developers must adhere to all applicable laws and regulations.





THE CONCEPT OF GREEN BUILDINGS

- Green buildings are designed, built, and operated in an environmentally friendly manner.
- Key principles include energy efficiency, water efficiency, and indoor air quality.
- Energy efficiency involves using materials and technologies that minimize energy consumption and greenhouse gas emissions.
- Water efficiency involves implementing water-saving fixtures and using rainwater harvesting systems.
- Indoor air quality is improved through non-toxic building materials, proper ventilation systems, and natural lighting.
- Sustainable building materials, such as recycled or renewable materials, are used to minimize environmental impact.
- Green buildings represent a holistic approach to sustainable design, considering environmental, social, and economic impacts.



ENERGY STAR BUILDINGS

- Energy Star buildings are designed to be energy-efficient and environmentally friendly.
- Certified by the EPA, they meet strict energy performance standards.
- Key features include high energy efficiency, using energy-efficient appliances, lighting, and insulation.
- Energy Star buildings often use LED lighting and high-efficiency HVAC systems.
- They focus on sustainability and environmental responsibility, reducing greenhouse gas emissions, water consumption, and waste generation.
- Benefits include better indoor air quality, temperature control, and lighting quality.
- Energy Star buildings may qualify for incentives and rebates from local utility companies or government agencies.
- They represent a sustainable and cost-effective approach to construction and operation.



RATING SYSTEMS FOR GREEN BUILDINGS



- Rating systems evaluate and measure sustainability and environmental performance of buildings.
- Key systems include LEED, developed by the U.S. Green Building Council, which uses a point-based system to assess buildings across various sustainability categories.
- LEED certification levels can be achieved by achieving different levels of certification, such as Certified, Silver, Gold, or Platinum.
- Green Star, an Australian rating system, evaluates buildings based on energy efficiency, water conservation, indoor environment quality, and innovation.
- Rating systems promote sustainable design and construction practices, encouraging the incorporation of sustainable features into projects.
- They contribute to creating more environmentally friendly and energy-efficient buildings.

THE LEED GREEN BUILDING RATING SYSTEM

- Developed by the U.S. Green Building Council (USGBC), it provides a framework for sustainable building design, construction, and operation.
- LEED certification levels are Certified, Silver, Gold, and Platinum, with Platinum being the highest level.
- Points are awarded based on meeting specific criteria within each category, such as reducing water usage, using sustainable materials, and optimizing energy performance.
- The LEED certification process includes registering the project with the USGBC, submitting compliance documentation, and undergoing a third-party review.



THE LEED GREEN BUILDING RATING SYSTEM +

- Strategies like installing solar panels, using low-flow fixtures, and incorporating green roofs can earn points towards higher LEED certification.
- Benefits of LEED certification include reduced operating costs, improved occupant health and productivity, and a smaller environmental footprint.
- LEED certification can enhance a building's marketability and value, demonstrating a commitment to sustainability and responsible building practices.



MEASUREMENT AND VERIFICATION IS VITAL



- M&V is a crucial process in energy efficiency and renewable energy projects, ensuring the realization of projected energy savings or performance improvements.
- It builds trust and credibility among stakeholders by providing transparent and reliable data on energy performance.
- Key components of M&V include baseline development, data collection, analysis, and reporting.
- Baseline development establishes a reference point against which energy savings or performance improvements can be measured.

MEASUREMENT AND VERIFICATION IS VITAL +

- Data collection involves collecting relevant information on energy consumption, system performance, and other parameters impacting energy use.
- Analysis of the data uses statistical methods, engineering calculations, and other techniques to quantify the energy savings or performance improvements.
- Results are reported to stakeholders in a clear and understandable manner, presenting actual energy savings, comparing them to projected savings, and identifying any influencing factors.



GREEN BUILDING PROJECTS AND MEASUREMENT AND VERIFICATION (M&V)



- M&V is the process of identifying, measuring, and quantifying utility consumption patterns over time.
- It is applicable to new construction and existing buildings and facilities.
- Technologies and methodologies exist to measure, verify, and document changes in utility usage.
- Tools are available in the form of M&V guidelines and protocols.
- The process typically involves five primary steps: pre-construction M&V assessment, development and implementation of the M&V plan, identifying the M&V project, establishing a baseline, providing a post-implementation report, and providing periodic site inspections and M&V reports.

GREEN BUILDING PROJECTS AND MEASUREMENT AND VERIFICATION (M&V) +

Four options are summarized in the IPMVP:
Option A: partially measured retrofit isolation,
Option B: Retroactively isolate the end use,
Option C: Whole-meter or main-meter approach,
and Option D: Use a whole meter or main meter with a calibrated simulation. Four options are summarized in the IPMVP: Option A: partially measured retrofit isolation, Option B: Retroactively isolate the end use, Option C: Whole-meter or main-meter approach, and Option D: Use a whole meter or main meter with a calibrated simulation.





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THANK YOU

