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HIGH-PERFORMANCE BUILDING DESIGN PROFESSIONAL - HBDP EXAM REFRESHER

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ONLINE TRAINING BY KRISHNAJI PAWAR

LEED AP(BD+C), GSAS CGP, GCP, ISO 14001

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MODULE

2

Sustainability Concepts

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**HIGH-PERFORMANCE
BUILDING DESIGN
PROFESSIONAL - HBDP
EXAM REFRESHER**

Understanding sustainability concepts can lead to holistic solutions to global challenges like climate change, poverty, and inequality, fostering interdisciplinary collaboration and collective action for a sustainable future.

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

Environmental Sustainability:

- Focuses on preserving ecosystems and natural resources for current and future generations.
- Practices include reducing greenhouse gas emissions, conserving water resources, and protecting biodiversity.
- Key concept is the concept of carrying capacity, which refers to the maximum population size an environment can sustainably support.

SOCIAL SUSTAINABILITY

- Ensuring equal access to resources and opportunities for all members of society.
- Considerations include social justice, human rights, and community well-being.
- Key aspects include providing access to education, healthcare, and affordable housing.
- Marginalization or exclusion of certain groups weakens the overall fabric of society.



SUSTAINABILITY CONCEPTS OVERVIEW +

Economic Sustainability:

- Focuses on creating resilient, adaptive economic systems.
- Balancing economic growth with environmental protection and social equity.
- Shifting to a circular economy can aid in waste reduction and foster economic sustainability.

Interconnectedness of Sustainability Concepts:

- Environmental degradation can lead to social inequity, while economic instability can undermine both.
- Holistic approaches to global challenges can be developed through interdisciplinary collaboration and collective action.



SUSTAINABILITY CONCEPTS

- Balancing economic, environmental, and social considerations to create a resilient society.
- Emphasizes the triple bottom line: economic prosperity, environmental stewardship, and social equity.
- Lifecycle thinking considers the environmental and social impacts of a product or service throughout its lifecycle.
- Both concepts aim to promote responsible and efficient use of resources for a more sustainable future.



ENERGY EFFICIENCY AND SUSTAINABILITY CONCEPTS

Energy Efficiency in Sustainability

- Involves optimizing energy use to minimize waste and environmental impact.
- Achieves desired outputs with minimal energy input through energy-efficient technologies, practices, and behaviors.
- Energy conservation involves reducing energy consumption by using less energy to achieve the same output.
- Energy management involves monitoring and optimizing energy use to improve efficiency.
- Energy efficiency reduces greenhouse gas emissions, mitigates climate change, and conserves natural resources.



ENVIRONMENTAL IMPACT

OVERVIEW

- Environmental impact refers to the effects of human activities on the environment, including ecosystems, natural resources, and ecological balance.
- Key factors include emissions, solid and fluid waste disposal, deforestation, habitat destruction, and pollution.
- Emissions, including carbon dioxide, nitrogen oxides, sulfur dioxide, and particulate matter, contribute to climate change by trapping heat in the atmosphere.
- Solid and fluid waste disposal, including plastics, paper, food scraps, and other materials, can lead to pollution and harm to wildlife.
- Fluid waste, such as wastewater from industrial processes or sewage treatment plants, can contain harmful substances that can contaminate water sources and harm ecosystems.
- Factory production, for example, emits pollutants into the air, generates solid waste, and discharges wastewater containing chemicals, affecting aquatic life.
- Understanding these factors can help implement sustainable practices and reduce ecological footprint, ensuring a healthy and thriving planet for future generations.



COMMISSIONING PROCESS IN BUILDING CONSTRUCTION



- Commissioning ensures all systems and components are designed, installed, tested, operated, and maintained according to owner's-project requirements (OPR) and design intent.
- The OPR document serves as a roadmap for the design and construction team, guiding them in meeting the owner's expectations.
- The commissioning process begins during the design phase and continues through construction, occupancy, and beyond.

KEY STAGES INCLUDE PLANNING, DESIGN REVIEW, CONSTRUCTION OVERSIGHT, FUNCTIONAL TESTING, AND ONGOING MONITORING.

- Planning stage: The commissioning team develops a commissioning plan and reviews the OPR to align with the owner's requirements.
- Design review stage: The team evaluates design documents to identify potential issues and ensure all systems meet the OPR.
- Construction oversight stage: The team monitors the installation and testing of building systems to verify their correctness and functionality.
- Functional testing: The team tests each system and component to ensure they operate according to the design intent and OPR.
- Ongoing monitoring: The team tracks the performance of building systems over time to ensure efficient operation.



DESIGN PROCESS OVERVIEW

- Involves defining project scope, goals, and objectives, understanding end user needs and constraints.
- Team formation involves diverse skill sets and backgrounds for a holistic problem-solving approach.
- Team dynamics are crucial for effective communication and collaboration, fostering a culture of open communication, trust, and respect.
- Documentation requirements capture and communicate design decisions, rationale, and outcomes.
- Documentation includes design briefs, sketches, prototypes, specifications, and other documents.

The design process is systematic and collaborative, leading to the development of high-quality, user-centered solutions.



WATER USAGE EFFICIENCY IN SUSTAINABLE BUILDINGS



- Sustainable buildings aim to minimize environmental impact by maximizing resource efficiency, including water usage.
- Water-saving fixtures and appliances, such as low-flow toilets, faucets, and showerheads, can significantly reduce water consumption.
- Water recycling and reuse systems, such as greywater recycling systems, can reduce reliance on freshwater sources and minimize water waste.
- Rainwater harvesting systems can capture and store rainwater for non-potable applications, reducing demand for municipal water supplies and decreasing stormwater runoff.
- Promoting water conservation behaviors among occupants through education and awareness campaigns can further reduce water consumption and contribute to long-term sustainability.

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INDOOR ENVIRONMENTAL QUALITY (IEQ)



- IEQ encompasses the overall indoor environment, including thermal comfort, ventilation, lighting, and air quality.
- Thermal comfort is influenced by air temperature, humidity levels, and air movement. ASHRAE standards guide comfort, considering factors like clothing insulation, activity level, and metabolic rate.
- Proper ventilation removes pollutants and odors, providing fresh air for occupants. ASHRAE recommends a minimum ventilation rate for different spaces.
- Air conditioning regulates indoor temperature and humidity levels, improving energy efficiency and comfort. Regular maintenance is crucial for optimal performance and air quality.
- Proper design, maintenance, and operation practices can enhance IEQ and occupant well-being.

UNDERSTANDING THE BUILDING ENVELOPE

- The building envelope is a crucial component of any structure, serving as a barrier between interior and exterior environments.
- It regulates heat transfer, controls moisture infiltration, and provides structural support.
- Key elements include the roof, walls, windows, doors, and foundation.
- Factors influencing the building envelope include insulation, air tightness, and moisture control.
- Thermal imaging surveys can identify areas of heat loss or gain, indicating insulation deficiencies or air leakage.
- Building envelope commissioning tests the performance of the envelope components to ensure they meet design specifications and building codes.
- Understanding the building envelope helps in designing energy-efficient, durable, and comfortable buildings.



NET-ZERO ENERGY BUILDING CONCEPTS

- Net-zero energy building concepts aim to generate as much energy as they consume annually, achieving a net-zero energy balance.
- Key aspects include energy efficiency through high-performance insulation, energy-efficient appliances, and advanced building systems.
- Renewable energy generation, such as solar panels, wind turbines, or other renewable energy sources, is also a key component.
- Innovative design strategies like passive solar design, building orientation, shading, and ventilation optimization are used to enhance energy efficiency and renewable energy generation.
- The Bullitt Center in Seattle, Washington, is an example of a net-zero energy building, combining solar panels, geothermal heating and cooling, and advanced energy-efficient technologies.



LIFE CYCLE ANALYSIS (LCA)

- LCA evaluates the environmental impacts of a product or activity throughout its life cycle.
- It includes stages from raw material extraction to disposal, each with associated environmental impacts.
- LCA provides a holistic understanding of environmental consequences.





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