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HEALTHCARE FACILITY DESIGN PROFESSIONAL

HFDP OVERVIEW

ONLINE PROFESSIONAL COURSES LED BY THE WORLD'S TOP SPECIALISTS

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MODULE 6

Testing, Balancing, and Commissioning

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HEALTHCARE FACILITY DESIGN PROFESSIONAL HFDP OVERVIEW

Testing, Balancing, and Commissioning (TBC) are crucial processes in the lifecycle of mechanical systems, particularly in heating, ventilation, and air conditioning (HVAC), plumbing, and fire protection systems. TBC ensures that systems operate as intended, meet design specifications, and provide optimal performance. The process involves several stages, including Functional Testing, Performance Testing, and Safety Testing.

Learning Objectives

- Introduction and Course Outline
- General Elements of Healthcare
- Health and built environment
- Health Care HVAC System Design Standards and Guidelines
- Certified Healthcare Facility Design Specialist Certification
- Testing, Balancing, and Commissioning
- Summary and Resources
- HFDP Practice Test V.4.1_Test Your Knowledge

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INTRODUCTION

Definition and Methodology of TBC

- TBC is a systematic process of evaluating a system or its components to verify that they conform to specified requirements.
- It includes Functional Testing, Performance Testing, and Safety Testing.
- Testing involves assessing whether the system performs its intended functions, measuring efficiency and effectiveness, and identifying potential hazards.
- Examples include checking the thermostat's temperature control, measuring airflow rates in ductwork, and verifying that sprinkler heads activate at the appropriate temperatures.

Balancing

- TBC involves adjusting and optimizing the distribution of fluids within a mechanical system to achieve uniform performance.
- It involves Air Balancing in HVAC systems and Hydronic Balancing in water-based systems.
- Balancing ensures that all parts of a mechanical system work together efficiently.

TESTING, BALANCING, AND COMMISSIONING (TBC) IN MECHANICAL SYSTEMS +

Commissioning

- TBC verifies and documents the design, installation, testing, operation, and maintenance of all systems and components of a building.
- It includes Pre-Commissioning, Commissioning Execution, and Post-Commissioning.
- Examples include reviewing HVAC, electrical, and plumbing systems, performing functional tests, verifying energy efficiency standards, and training maintenance staff.
- TBC is akin to launching a new software application, ensuring that the final product functions as intended and meets user needs.

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BUILDING COMMISSIONING AND PERFORMANCE OPTIMIZATION

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Understanding Existing Conditions Prior to Renovation

- Comprehensive evaluation of the building's current state is vital before renovation.
- The assessment identifies deficiencies such as outdated systems, energy inefficiencies, and compliance with building codes.
- It establishes baselines for performance metrics and informs the renovation's design and scope.

Methods of Assessment

- Visual Inspections: Conducting walkthroughs to identify visible wear and tear, safety hazards, or inefficiencies.
- Building Diagnostics: Using thermal imaging cameras to detect insulation deficiencies or air leaks.
- Performance Monitoring: Analyzing historical utility data to understand energy use patterns and identify anomalies.

Identifying Commissioning Performance Metrics

- Key Performance Metrics include Energy Efficiency, Indoor Air Quality (IAQ), Thermal Comfort, and System Reliability.
- A successful commissioning process should result in a lower Energy Use Intensity (EUI), lower Indoor Air Quality (IAQ), and consistent thermal comfort.

BUILDING COMMISSIONING AND PERFORMANCE OPTIMIZATION +

Test Procedures for Commissioning Unique Pressure Relationships

- Differential Pressure Gauges: Installing gauges to measure pressure differences across spaces.
- Smoke Testing: Visualizing airflow patterns to maintain pressure differentials.
- Flow Measurement: Utilizing anemometers to measure airflow rates and align with design specifications.

Understanding Various Control Sequences

- Occupancy-Based Controls: Adjusting HVAC operation based on occupancy levels.
- Demand-Controlled Ventilation (DCV): Adjusting outside air intake based on CO2 levels.
- Setback and Setpoint Control: Adjusting temperature settings based on time of day.
- Fault Detection and Diagnostics (FDD): Monitoring performance and anomalies to alert maintenance personnel to issues.

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COMMISSIONING IN BUILDING RENOVATION AND PERFORMANCE OPTIMIZATION

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Understanding Existing Conditions Prior to Renovation

- The assessment of existing conditions is crucial for identifying deficiencies, establishing baselines, and informing the design and scope of the renovation.
- Methods of assessment include visual inspections, building diagnostics, and performance monitoring.
- A 30-year-old office building's HVAC systems are operating at 60% of their original efficiency due to lack of maintenance and outdated technology.

Recognizing Performance Metrics of Commissioning

- Key performance metrics include energy efficiency, indoor air quality, thermal comfort, and system reliability.
- A successful commissioning process should result in a lower Energy Use Intensity (EUI), lower Indoor Air Quality (IAQ), and consistent thermal comfort.
- A successful commissioning process aims for decreased downtime and improved energy efficiency.

COMMISSIONING IN BUILDING RENOVATION AND PERFORMANCE OPTIMIZATION +

Test Procedures for Commissioning Unique Pressure Relationships

- Differential pressure gauges are used to measure pressure differences across spaces.
- Smoke testing is used to visualize airflow patterns and ensure maintenance of pressure differentials.
- Flow measurement is used to ensure airflow rates align with design specifications.

Understanding Various Control Sequences

- Control sequences are the algorithms governing the operation of building systems, particularly HVAC systems.
- Types of control sequences include Occupancy-Based Controls, Demand-Controlled Ventilation (DCV), Setback and Setpoint Control, and Fault Detection and Diagnostics (FDD).
- Implementing these controls can lead to energy savings and reduced operational costs.

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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.

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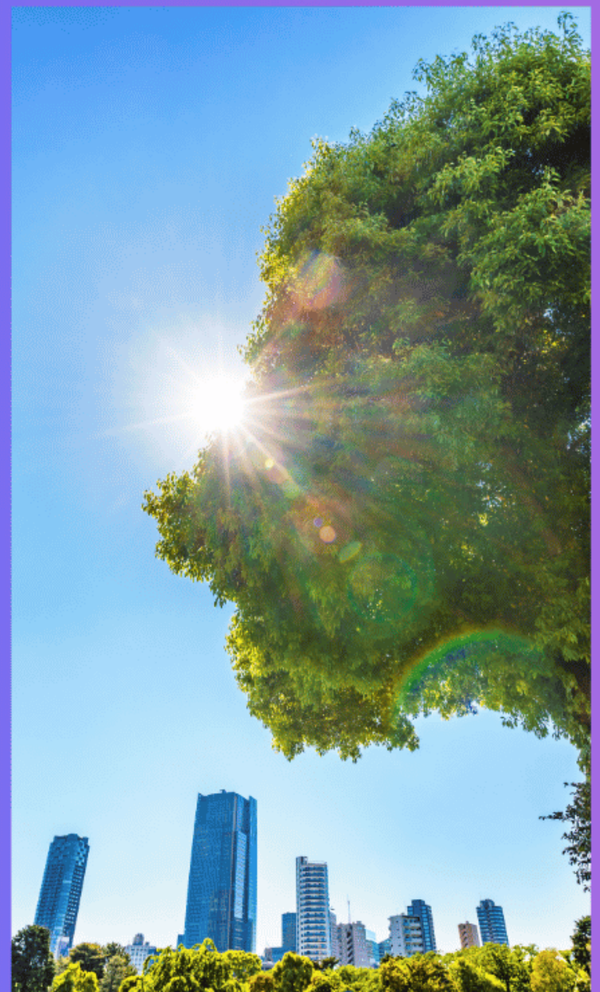
RATING SYSTEMS FOR GREEN BUILDINGS



- 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.

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THE LEED GREEN BUILDING RATING SYSTEM

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- 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 +

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- 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.

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