



Department of Civil Engineering

Name of Subject: - **ENERGY CONSERVATION & GREEN BUILDING (ECG)**

Course Code: - **315316**

Scheme:- **CE-5K**

Semester:- **Fifth**

Unit No. 04

Green Building Audit

CO4 - Conduct the green and environment audit for a green building

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
IV	Green Building Audit	CO4	10	0	8	10	18

THEORY SYLLABUS CONTENT

Unit - IV Green Building Audit

- 4.1 Introduction to Green Building Audits: Definition, scope, Importance and benefits of green building audit.
- 4.2 Planning and Preparation for Green Building Audits: Setting audit objectives and scope, Developing an audit plan and checklist.
- 4.3 Conducting the Green Building Audits: On-site audit procedures and techniques, Data collection methods (e.g., interviews, observations, document reviews).
- 4.4 Reporting and Documentation: Audit reports and documentation, Communicating audit findings and recommendations, Corrective Actions and Continuous Improvement.

Subject Incharge

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Unit - 04

Green Building Audit

Definition of Green Building audit

A Green Building Audit is a systematic process of evaluation a building's environment performance in relation to sustainability parameters such as energy efficiency, water, conservation, water usage, waste management, and indoor environmental quality.

Scope :-

- 1) It checks whether the building uses energy efficiently
- 2) It checks water use, water-saving systems and rainwater harvesting.
- 3) It examines how waste is separated, recycled and disposed of.
- 4) It checks indoor air quality, lighting, ventilation and comfort.
- 5) It checks whether eco-friendly and reusable materials are used
- 6) It checks the building site, greenery and compliance with green building rules

* Importance of Green Building audits :-

- 1) Audits helps ensure that a building complies with established environment standards and certifications, thus reducing its ecological footprint.
- 2) Identifies areas where resources like energy and water are being wasted, allowing corrective measure to be implemented.
- 3) Provides a baseline and benchmarks for the building's performance, helping to measure improvements over time.
- 4) Improve indoor air quality, thermal comfort, and overall occupant well-being by identifying and mitigating environment risk

- 5) Ensures that the building complies with legal and regulatory frameworks, reducing the risk of penalties & Improving public Image
- 6) A necessary step for achieving green building ratings such as LEED, IGBC, and GRIHA, which can enhance the market value of the property.

Benefits of Green Building Audit

- 1) Reduction in energy and water consumption, lower emissions, and waste control
- 2) Cost saving from lower ~~the~~ utility bills and improved operational efficiency
- 3) Enhanced indoor air quality, lighting, and thermal comfort for occupants
- 4) Improved system performance, maintenance efficiency, and facility longevity.
- 5) Easier adherence to environmental laws and green rating systems
- 6) Availability of performance metrics for decision-making and continuous improvement
- 7) Encourage adoption of modern, sustainable, and smart building technologies.

* Planning and Preparation for Green Building Audit

- 1) Define Audit Objective and scope
- ↓
- 2) Form Audit team
- ↓
- 3) Gather preliminary building information.
- ↓
- 4) Review applicable standards and rating systems
- ↓
- 5) Develop an audit checklist and plan
- ↓
- 6) Calibrate tools and prepare instruments.
- ↓
- 7) Schedule site visits and inform stakeholder
- ↓
- 8) Risk assessment and safety planning
- ↓
- 9) Pilot survey (Optional but Recommended)

1] Define Audit, Objectives and Scope:-

The first step is to clearly define what the audit aims to achieve. Objectives may vary depending on the building type, occupancy, certification goals, or sustainability policies.

Example: Define scope of audit:-

Full building lifecycle or specific system (eg. HVAC, lighting, water). decide if the audit is for certification, compliance, retrofit planning, or performance benchmarking.

Example:- A hospital may prioritize indoor air quality and energy efficiency, while a university campus may focus on waste management and water use.

* From the Audit team multidisciplinary team ensures expertise in all relevant domains. The team can include:

- a) Energy auditors and sustainability consultants
- b) Mechanical and electrical engineers
- c) Architects or green building designers
- d) LEED/IGBC accredited professionals
- e) Third-party verification experts
- g) The team should include members familiar with the building's operations and documentation, such as facility maintenance personnel.

2] Gather Preliminary Building Information.

Key documents to collect include.

- a) Architectural and engineering drawing (floor plans, MEP plans)
- b) Equipment specification (HVAC, lighting, pumps)
- c) Utility bills (electricity, water, fuel) for the past 12-24 months.
- d) Building occupancy data and usage patterns.

3] Review Applicable Standards and Rating Systems:-

The audit preparation must consider the framework or certification the building is aligned with different applicable standards and rating systems (LEED, IGBC, BREEAM, etc)

4) Developing an Audit Plan and checklist

The audit plan outlines the who, what, when, where, and how of the audit process, while the checklist itemize the criteria and parameters to be assessed across sustainability domains such as energy, water indoor air quality, material and waste.

5) Calibrate Tools and Prepare Instruments

- Green building auditors require specialized tools for measurement and verification. Ensure instruments are calibrated and tested before deployment.
- Common tools and instruments that are used in green building audits are mentioned below.
 - a) LUX meters
 - b) Thermal cameras
 - c) Power analyzers
 - d) Flow meters
 - e) Air quality monitors

6) Schedule site visits and Inform Stakeholders!

Coordinate with building management and users to fix dates for walkthroughs and interviews, gain access to restricted areas like plant rooms or rooftops, Inform staff about audit activities to ensure cooperation and Stakeholder involvement help gather qualitative data and improve the implementation of post-audit recommendations.

7) Risk Assessment and Safety Planning

- Auditors must plan for health and safety during inspections, especially in high-risk zones (boiler rooms, electrical panels, roofs), safety precautions, use PPE (hard hats, safety boots, harnesses)
- Obtain necessary permits and approvals, and conduct safety briefing with the audit team.

8) Pilot survey (Optional but Recommended)

In large or complex buildings, a pilot audit on a representative area (like one floor or wing) helps test the audit approach and refine tools/checklists before full rollout.

* Step-by-step on-site Audit Procedures :-

- 1) Pre-audit Briefing and orientation.
- 2) Physical walk-through inspection
- 3) Instrument Based measurement
- 4) ~~Data~~ 

* Data collection Methods :-

1) Interviews

Conduct the interview with building manager, maintenance staff and occupants to understand the operational practice and challenges.

2) Observations :-

- Confirm presence & condition of sustainability infrastructure
- Identify inefficiencies
- Evaluating lighting, ventilation, & signage use.
- Use standardized sheet @ mobile apps for realtime data collection.

3) Document reviews

Reviewing historical and technical documents helps validate performance claims and uncover gaps and keep it for evidence.

4) Surveys and questionnaires :-

- collect feedback via online forms @ printed questionnaire
- Focus on comfort levels, awareness of green initiatives and improvement suggestions.

* Audit Reports and Documentation :-

1. Executive Summary

- a) A high-level overview of audit objectives, scope, and key findings.
- b) Performance highlights and summary of recommendations
- c) Suggested certification level (if applicable)

2. Introduction :-

- a) purpose of the audit
- b) Audit team composition and qualifications
- c) Audit timelines and methodology used.

3. Building Description

- a) Basic Information: Building type, location, size (Built up area), age
- b) Occupancy patterns, climatic zone, and operational hours
- c) Energy systems, water systems, material use

4. Audit Scope and Methodology :-

- a) Categories covered: energy, water, IEQ, waste, materials, etc.
- b) Tools used: Walkthrough inspection, measurement, document reviews, interviews.
- c) Compliance framework followed (eg IGBC, LEED, ECBC)

5. Finding Analysis by category :-

The findings of the communication are often delivered in consideration of categories like energy efficiency, water efficiency, IEQ, waste management, material usage, site sustainability with their current performance data, compliance status, visual documentation.

* Communicating Audit Findings and Recommendations

Once the audit of green building is complete and the data has been analyzed, the next critical step is to effectively communicate the findings and recommendations to key stakeholders. These may include the building owner, facility management team, sustainability officers, occupants, and regulatory or certification bodies.

Key Outcomes of Communication:

- a) Transparency and accountability
- b) Informed decisions by management
- c) Stakeholder awareness of performance.
- d) Successful implementation of improvements.
- e) Support for certification and compliance.

* Corrective Action:-

Corrective actions are the specific measures taken to resolve issues or inefficiencies identified during the green building audit.

Objectives of corrective actions

- i) Eliminate inefficiencies in building systems.
- ii) Bring the building into compliance with applicable green standards (LEED, IGBC, BREEAM)
- iii) Improve comfort, health, and well-being for occupants.
- iv) Reduced operation cost and environmental footprint

*Continuous Improvement in Green Building Performance

Role of Continuous Improvement in Green certifications and Re-certifications.

- 1) Green certification system like LEED (O+M), IGBC Existing Building, and BREEAM In-use reward buildings for continuous performance tracking and upgrades.
- 2) In the auditing, the points are awarded for several parameters that are possible due to continuous improvement.
- 3) It is vital components of sustainable building management ensure that green buildings not only achieve high performance at one point in time but also maintain and improve upon that performance throughout their lifecycle.
- 4) Ensuring long-term performance, cost savings, occupant well-being and alignment with global sustainability goals, while making buildings valuable assets in the green economy.



Assignment Questions

Unit No. 04

Green Building Audit

1. Define a green building audit
2. State the Importance of Green Building Audit.
3. State any four global organizations involved in green building assessment
4. Global organizations involved in green building assessment and briefly mention their focus areas.
5. What is the importance of planning and preparation before conducting a green building audit?
6. Describe the role of checklists and tools in a green building audit.
7. Data required in any type of checklist used for green building audit.
8. Explain any three data collection methods used during a green building audit.
9. Give an overview of the benefits of green building audits under and health aspects.
10. Give an overview of the benefits of green building audits under environmental aspect.
11. Give an overview of the benefits of green building audits under economic aspect.
12. What are corrective actions in the context of green building audits? Give examples.
13. How is continuous improvement ensured in green building performance post-audit?
14. Explain the steps involved in developing a green building audit plan
15. State the importance of Documentation