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WELCOME TO BEYOND MONITORING BASED COMMISSIONING - MBCX

ONLINE TRAINING

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07

LEED Certification and MBCx

SECTION - MBCX



Every few years the Leadership in Energy & Environmental Design (LEED) certification program goes through a review process and is updated to reflect the constantly changing technologies of today's world and ways in which to leverage them to improve building performance. When the LEED program was updated to Version 4, a new option was added to the Enhanced Commissioning section: „Option 2: Enhanced and Monitoring-Based Commissioning“. In Option 2, various steps are outlined to fulfill the monitoring-based commissioning credit. While the list is short, many new terms such as „energy analysis software“ and „fault detection and resolution“ stand out and lead to an important question: What is monitoring-based commissioning?





Preparing Countries & Tomorrow's Commissioning Specialists

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Learning Objectives

- Introduction
- MBCx Process
- LEED MBCx

Introduction

- Monitoring-based commissioning, also known as MBCx, is a procedure that makes use of automated data analytics to monitor the operation of a building's systems in a continuous manner throughout the building's lifetime.
- When a building has been commissioned or retro-commissioned for the first time, it is the ideal time to establish an MBCx programme.
- This guarantees that the building is working correctly to fulfil the present demands of the facility, and it also allows for the definition of a baseline operation.
- After then, the performance of these systems will be continually checked and compared to the information that was collected as a baseline.
- It is going to be automatically recognised by qualitative and quantitative methods of evaluations as soon as the performance of the building starts to decrease, which is also known as "building drift."
- As soon as the drift has been identified, steps will be made to correct the problems that have been noticed.
- MBCx ensures that a building can be continuously maintained to help with energy consumption and occupant comfort.
- This can be in the form of a clear recommended action, such as fixing a failed actuator, or it can be in the form of signs that a larger effort, such as re-commissioning the building, may be required.

MBCx – Process

- One of the first steps of implementing a MBCx process is to determine what should be monitored.
- It is always beneficial to hold a design phase meeting to review the MBCx plan and the MBCx action plan.
- The MBCx plan should provide an outline for the scope of the MBCx process and an implementation plan, while the MBCx action plan should define how the MBCx process will be utilized by the Owner after building turnover.
- Both plans should clearly define roles and responsibilities, as implementing MBCx is a team effort.
- The MBCx plan must also define what desired meters, monitoring points and key performance indicators (KPIs) will be monitored and reviewed.
- Remember, it can't be managed if it isn't metered!
- Main electrical meters, natural gas meters and water meters have routinely been used to benchmark whole building performance.
- Furthermore, submeters can also be installed to assess HVAC system, lighting, plug loads, renewable energy and any other significant loads.
- Once the level of metering has been determined, we must next understand how the information can be relayed back to the staff and team.
- To accomplish this, an energy management information system (EMIS) must be specified.
- The EMIS will gather all the metered data and convert it to easily readable graphs, tables and other qualitative means of assessment.
- All data and information should be aggregated back to a user-customized dashboard that is easy to view and navigate.
- Depending on the building, the EMIS can be native to the building automation system, or a third-party software may be used.
- Whichever method is chosen, the installation and setup of the system is the most crucial step.
- For the MBCx process to persist, the data must be accurate and easy to digest by the team.

MBCx – Process

- Along with metering, fault detection and diagnostic alarms can be incorporated into the EMIS.
- Like the check engine light in a car, these alarms will provide alerts whenever faults are detected and provide recommendations as to what the root cause of the issue may be (see my article on ASHRAE Guideline 36 for an example of these alarms).
- In a building with numerous pieces of equipment and thousands of control sensors and devices, these alarms can proactively address issues that would previously go undetected.
- These alarms are generated as they occur, which prevents them from evolving into larger systemic problems.
- These alarms can also be prioritized to make sure the high-level alarms are prominently displayed and addressed first.
- Now that the system has been installed, it's time to start analyzing!
- Over time the software will analyze and display the consumption of the metered systems.
- Analysis can be done through an automated process or manually.
- Sophisticated software can compare metered data to many variables, such as outside air temperature, degree-days, or even production KPIs.
- Alternatively, metered data may also be reviewed manually at defined intervals (monthly, quarterly, annually).
- If multiple buildings are being metered, they can even be combined on one dashboard for easy benchmarking and review.
- Once staff has been adequately trained, the MBCx action plan should be followed to review issues and abnormalities and take corrective action as needed.
- MBCx will also act as a persistent strategy for verification of future energy projects.
- The owner can be confident that when an energy project is implemented, a baseline is already defined, and the results can easily be tracked.

The key components of a measurement and verification system for MBCx are as follows:

- Building the DDC System—used for the implementation of energy-efficiency strategies and for collecting system-process data;
- Building energy model(s)—used to create optimised control sequences and calibrated to produce energy benchmark targets;
- Energy End-use Sub-metering: used in conjunction with benchmarks to determine sub-system performance; used for long-term tracking of system performance;
- Metering System Calibration Tools—necessary to provide reasonable, trust-worthy data for the MBCx investigation;
- Data Acquisition System and Remote Database—required to collect and store DDC and energy-metre data for EMS analysis;
- Energy Management System and/or Analysis Software—required to conduct energy calculations, analyse trend logs, and create energy and performance baselines through statistical calculations;



MBCx Requirements for New Construction:

- Include performance and metering system requirements in the Owner's Performance Requirements (Owner, CxA)
- Having overall building performance requirements (energy/CO2/cost avoided), as well as intent for rigorous verification of performance through MBCx ensures that the design team must pay particular attention to performance outside of design conditions, and engage the building energy modeler to conduct parametric analysis of system options and control strategies.



Establish key components of system efficiency in the Basis of Design (CxA, Consultants)

- Summarizing the key efficiency strategies early in the design process ensures that particular attention is paid to these features as the design progresses. The CxA can review these and provide design efficiency feedback if qualified to do so. Listing the strategies also helps in the development of the MBCx plan to determine metering requirements that ensure efficiency strategies are functioning properly.

Create a MBCx plan including metering system design and incorporate into projects specifications (CxA)

- The MBCx plan should reiterate the building overall performance targets as well as the strategies to meet these targets. The metering points to verify performance should be specified in detail (electric power, gas flow rates, thermal power, and additional flows and temperatures). The data acquisition and energy management systems should also be specified. Building energy model calibration should be included with the data required from the models to produce energy targets.

Conduct one review of design documents for further energy efficiency opportunities and one review of energy modeling inputs (CxA, EMP)

Control sequences are not established to improve building efficiency, which is one of the main reasons buildings collapse. Designers give building controls providers general sequences without optimising performance. The control provider then executes successful sequences that may not be optimal for the project. Finally, building operators override numerous energy-saving initiatives that cause system or comfort difficulties. The designer should know how the system will be operated through a range of operation and ideal reset, sequencing, and enabling sequencing determined through energy modelling or CxA advice when developing detailed sequences of operation. The CxA will work with the controls provider and building operators to implement these control sequences.



Identify opportunities for improvement and resolve performance discrepancies (CxA, O&M, DDC)

Train operation and maintenance staff in the use of the energy-metering/performance-tracking system (CxA, O&M)

Calculate and report actual building performance (CxA, EMP)

Calculate and report actual building performance (CxA, EMP)



Monitoring Based Commissioning for LEED Building Performance Optimization

Monitoring-based commissioning is a developing field, with plenty of room for growth and innovation. MBCx demands experience in commissioning, energy modeling, energy auditing, and measurement and verification field in order to integrate this process with building design and construction and to result in optimal building performance.





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