

BEYOND

SMART CITIES

MAINTENANCE AND COMMISSIONING - CEM

REFRESHER TRAINING COURSE

KRISHNAJI PAWAR, LEED AP BD+C, GSAS CGP, ISO 14001:2015, GCP

CEM REFRESHER TRAINING COURSE

ENERGY MANAGEMENT SOCIETY

BEYOND SMART CITIES

Energy Management Society

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HIGH PERFORMANCE GREEN BUILDINGS

FOR ENERGY PROFESSIONALS

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LEARNING OBJECTIVES



LEED Program and Benefits

LEED Certification & Systems Verification

Benefits of LEED Commissioning

Global Sustainability Assessment System (GSAS) Program

Systems Commissioning, Guidelines for Systems Commissioning

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LEED PROGRAM AND BENEFITS

LEED provides a framework for healthy, efficient, carbon and cost-saving green buildings. LEED certification is a globally recognized symbol of sustainability achievement and leadership.

LEED certified buildings save money, improve efficiency, lower carbon emissions and create healthier places for people. They are a critical part of addressing climate change and meeting ESG goals, enhancing resilience, and supporting more equitable communities.

To achieve LEED certification, a project earns points by adhering to prerequisites and credits that address carbon, energy, water, waste, transportation, materials, health and indoor environmental quality.

Projects go through a verification and review process by GBCI and are awarded points that correspond to a level of LEED certification: Certified (40-49 points), Silver (50-59 points), Gold (60-79 points) and Platinum (80+ points).



LEED RATING SYSTEM GOALS

LEED is a holistic system that doesn't simply focus on one element of a building such as energy, water or health, rather it looks at the big picture factoring in all of the critical elements that work together to create the best building possible.

In fact, 35% of the credits in LEED are related to climate change, 20% of the credits directly impact human health, 15% of the credits impact water resources, 10% of the credits affect biodiversity, 10% of the credits relate to the green economy, 5% of the credits impact community and 5% of the credits impact natural resources. In LEED v4.1, a majority of the LEED credits are related to operational and embodied carbon.



LEED RATING SYSTEM GOALS +

Reduce contribution to global climate change

Enhance individual human health

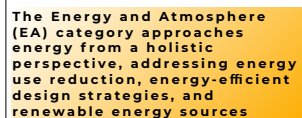
Protect and restore water resources

Protect and enhance biodiversity and ecosystem

Promote sustainable and regenerative material cycles

Enhance community quality of life





EA PR FUNDAMENTAL COMMISSIONING AND VERIFICATION

EA PR MINIMUM ENERGY PERFORMANCE

EA PR BUILDING-LEVEL ENERGY METERING

EA PR FUNDAMENTAL REFRIGERANT MANAGEMENT

EA CR ENHANCED COMMISSIONING/EA CR OPTIMIZE ENERGY PERFORMANCE

EA CR ADVANCED ENERGY METERING / EA CR DEMAND RESPONSE

EA CR RENEWABLE ENERGY PRODUCTION / ENHANCED REFRIGERANT MANAGEMENT



EA - PR- CONSTRUCTION

INTENT

To support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.

POTENTIAL TECHNOLOGIES & STRATEGIES

✓ The qualified commissioning authority (CA) chosen to represent the owner's needs should be brought in early in the design process. As a third party, the CXA can verify early on that the architects' and engineers' designs meet the owner's project requirements. During the construction phase, the commissioning team, led by the CXA, will verify that contractors install and program the systems correctly according to the design.

FUNDAMENTAL COMMISSIONING AND VERIFICATION

REQUIREMENTS

Complete the following commissioning (Cx) process activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies, in accordance with ASHRAE Guideline 0-2013 and ASHRAE Guideline 1.1-2007 for HVAC&R Systems, as they relate to energy, water, indoor environmental quality, and durability.

Develop the OPR.

Develop a BOD.

IMPLEMENTATION

REQUIRED DOCUMENTATION

Documentation	All projects
C	X
	X
List of systems to be commissioned	X
Verification of Cx activities and reviews	X
Cx plan	X
Documentation of testing and verification	X
CPIL QM plan	X
Cx contract	X

EA- CR(6) - DESIGN

INTENT

To further support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.

POTENTIAL TECHNOLOGIES & STRATEGIES

Enhanced commissioning is a natural extension of the fundamental commissioning (Cx) process. It provides owners, via the commissioning authority (CxA), further oversight and verification that the building will meet their expectations and requirements beyond the first day of occupancy. Enhanced commissioning gives the CxA the power to act as the owner's advocate by conducting in-depth reviews of the basis of design, design documents, and construction submittals. Training and a postconstruction verification visit are some of the enhancements that contribute to ongoing quality building control and operations.

ENHANCED COMMISSIONING

REQUIREMENTS

Implement, or have in place a contract to implement, the following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification.

The commissioning authority must do the following:

- ✓ Review contractor submittals.
- ✓ Verify inclusion of systems manual requirements in construction documents.
- ✓ Verify inclusion of operator and occupant training requirements in construction documents.
- ✓ Verify systems manual updates and delivery.
- ✓ Verify operator and occupant training delivery and effectiveness.
- ✓ Verify seasonal testing.
- ✓ Review building operations 10 months after substantial completion.
- ✓ Develop an on-going commissioning plan. Include all enhanced commissioning tasks in the OPR and SOI.

IMPLEMENTATION

REQUIRED DOCUMENTATION

Documentation	Option 1, Path 1	Option 1, Path 2	Option 2
List of all tasks completed as part of Co Activities	X	X	X
Training outline and participation list	X	X	X
Confirmation of systems manual delivery	X	X	X
Origins Co plan	X	X	X
Inclusion of monitoring and tracking in Co plan		X	
Inclusion of envelope in Co plan			X
Verification of additional reviews per Data Center requirements (Data center only)	X	X	

HOW DO CXA AGENTS USE LEED

Reviewing design plans to ensure they meet owner's objectives and LEED Certification requirements

Providing commissioning services required by LEED Certification requirements

Ensuring that equipment and systems are functioning at the efficiency level for which they were designed

Scheduling site visits and tests throughout the construction cycle to ensure on-going efficiency

Modifying control programs to enhance occupant comfort while reducing energy consumption and increasing operational efficiency



BENEFITS OF LEED COMMISSIONING

Identifying Energy Conservation Measures (ECMs)

Evaluating potential rebates

Tenant/Occupant Comfort

Identifying possible future operational issues

Promote sustainable and regenerative material cycles

Enhance community quality of life



GSAS PROGRAM AND BENEFITS

The primary objective of GSAS is to create a sustainable built environment, considering the specific needs and context of the region.

GSAS certifications aim to evaluate the sustainability of the built environment through providing a performance-based approach for assessment, considering the reduction of the environmental impacts of the built environment by adopting the best practices.

GSAS aims to promote the adoption of sustainability into regulatory requirements and building codes, hence making sustainability business as usual (QCS 2014 Qatar Construction Specifications (Section 7) -Green Constructions) .