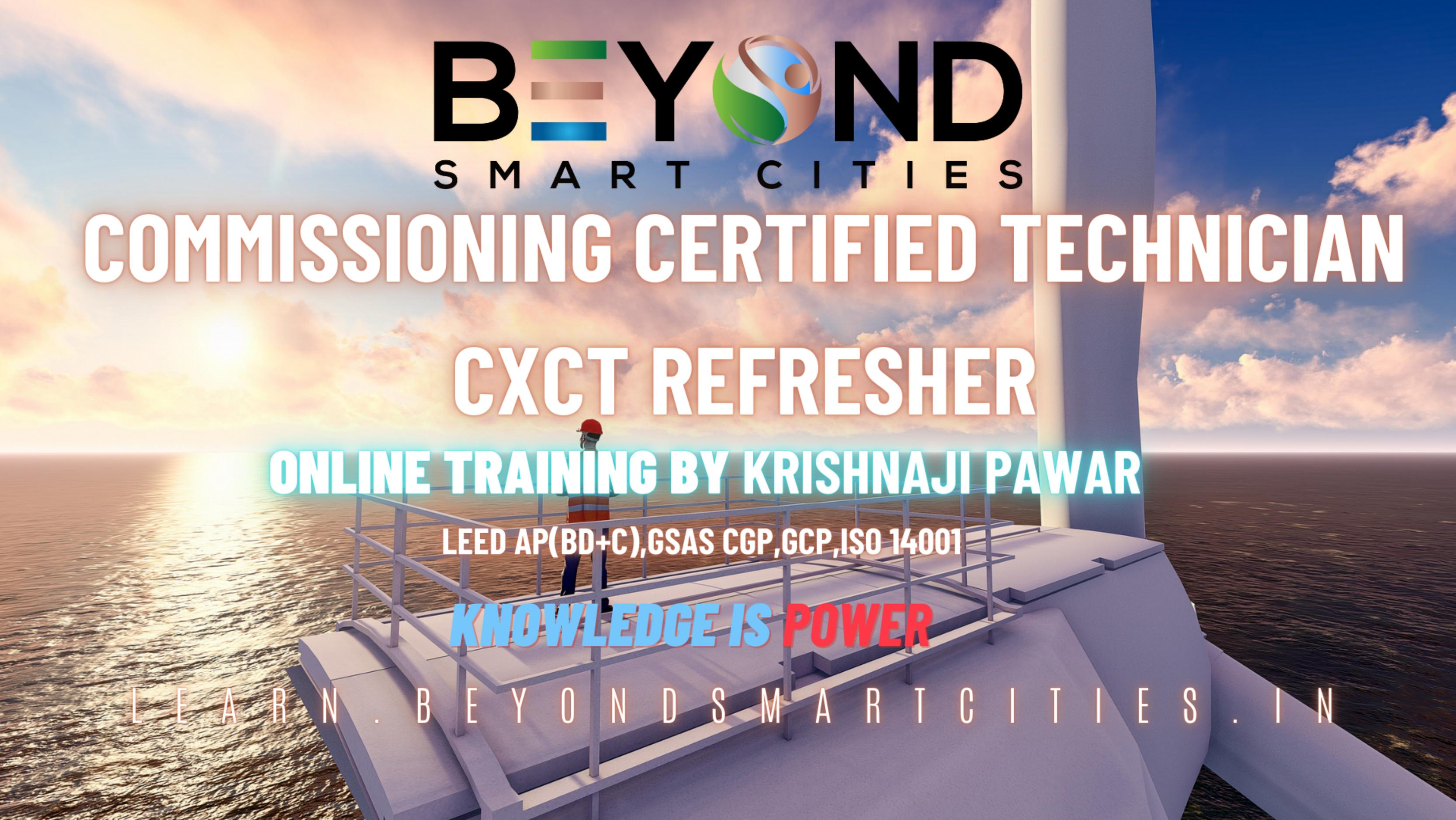


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BEYOND SMART CITIES



B E Y O N D
S M A R T C I T I E S

COMMISSIONING CERTIFIED TECHNICIAN

CXCT REFRESHER

ONLINE TRAINING BY KRISHNAJI PAWAR

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

KNOWLEDGE IS POWER

L E A R N . B E Y O N D S M A R T C I T I E S . I N

BEYOND
SMART CITIES

MODULE
01

Introduction and Course Outline

KRISHNAJI PAWAR - CEO & FOUNDER
LEED AP(BD+C),GSAS CGP,GCP,ISO 14001

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BRIEF ABOUT ME

Krishnaji PAWAR

CEO & FOUNDER

Krishnaji Pawar is founder and CEO of Beyond Smart Cities. Before being named CEO in January 2020, Krishnaji held leadership roles at Beyond Smart Cities in both Sustainability ,Energy & Environmental Consultancy.

Specialized in developing sustainable design strategies for Green Building Certification Systems (LEED, GSAS, etc.), Energy & Water Conservation, Commissioning, Environmental Impact Assessment & Environmental Management Systems.

Currently responsible for 3,787 million square feet Green Building /Energy modeling Consulting since January 2008 in UAE, India and Qatar.



COMMISSIONING CERTIFIED TECHNICIAN CXCT REFRESHER

The Commissioning Certified Technician - CxCT Refresher training program covers HVAC systems, field TAB verification, CCxT responsibilities, pre-function tests, calibration, functional tests, troubleshooting, O&M paperwork, preventive maintenance, retro-commissioning, commissioning professional certification, green building rating systems, and exam sample questions.

Learning Objectives

- **Course Overview and Introduction**
- **CCxT's Technical, Communication, and Commissioning Skills**
- **Heating, Ventilation, and Air-Conditioning (HVAC) Systems**
- **Basics of field TAB verification, HVAC systems and controls**
- **CxT Responsibilities by Phase**
- **Pre-function tests include sheet checking and installation tests.**
- **Point-to-point calibrate MEP and sensor systems.**
- **Verify TAB pre-functional tests and CxT responsibilities**



INTRODUCTION

- The NEBB Commissioning Certified Technician (CxCT) Refresher course is a program that updates and reinforces the knowledge and skills of technicians who have already earned their CxCT certification.
- The course aims to update knowledge on new tools, techniques, and best practices in commissioning, strengthen practical skills, foster networking opportunities, and ensure regulatory compliance.

Key areas covered in the course include:

- Commissioning Process Overview: A review of the commissioning process, including planning, execution, and documentation.
- System Types and Functionality: An analysis of diverse building systems, such as HVAC, plumbing, electrical, and renewable energy systems.
- Measurement and Verification Techniques: Exploration of measurement tools and techniques used to assess system performance.
- Troubleshooting and Problem-Solving: Techniques for identifying and resolving issues during the commissioning process.
- Documentation and Reporting: The importance of thorough documentation throughout the commissioning process.
- The course promotes a culture of excellence and accountability within the commissioning industry, leading to improved building performance and occupant satisfaction

Learning Objectives

- Functional tests, records, and observations
- Airside, water, and control system troubleshooting
- Heating, Ventilation, and Air-Conditioning (HVAC) Systems Required O&M paperwork and training Preventive maintenance
- Retro-commissioning
- Commissioning professional certification & its importance.
- Point-to-point calibrate MEP & sensor systems.
- Green building rating systems & commissioning
- Summary and Resources
- CxCT Practice Exam: Test Your Knowledge!



INTRODUCTION

The role of the CxCT is increasingly vital in contemporary construction and facility management.

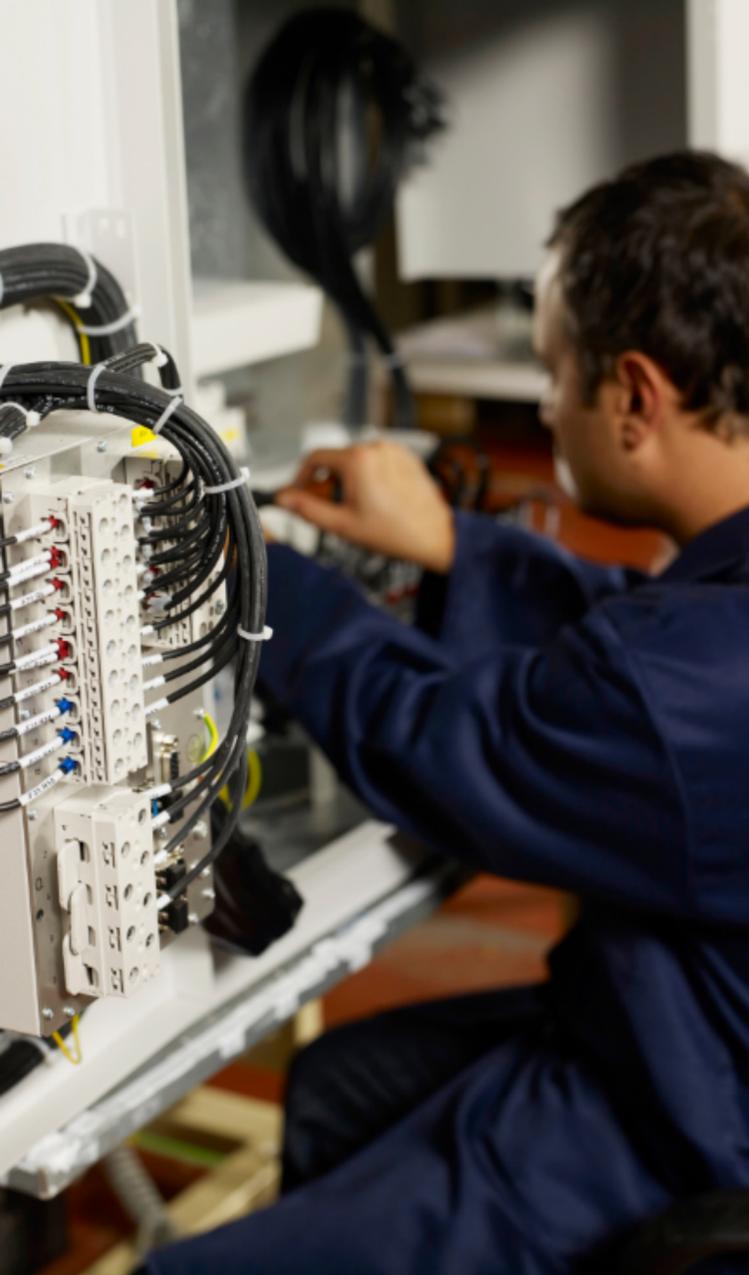
Key takeaways include:

- Introduction to HVAC Systems.
- CxT Responsibilities by Phase.
- Pre-function tests and calibration of MEP and sensor systems.
- Functional tests, records, and observations.
- Troubleshooting involves airside, water, and control systems.
- Required O&M paperwork and training.
- Preventive maintenance and retro-commissioning.
- Commissioning professional certification.
- Green building rating systems and commissioning.
- CxCT Practice Exam: Test Your Knowledge!

NEBB COMMISSIONING CERTIFIED TECHNICIAN (CXCT) REFRESHER

- The NEBB Commissioning Certified Technician (CxCT) Refresher course is a program that updates and reinforces the knowledge and skills of technicians who have already earned their CxCT certification.
- The course aims to update knowledge on new tools, techniques, and best practices in commissioning, strengthen practical skills, foster networking opportunities, and ensure regulatory compliance.
- The course covers the commissioning process, system types and functionality, measurement techniques, troubleshooting, and documentation, focusing on diverse building systems, measurement tools, troubleshooting, and problem-solving techniques, emphasizing the importance of thorough documentation.
- The course promotes a culture of excellence and accountability within the commissioning industry, leading to improved building performance and occupant satisfaction.

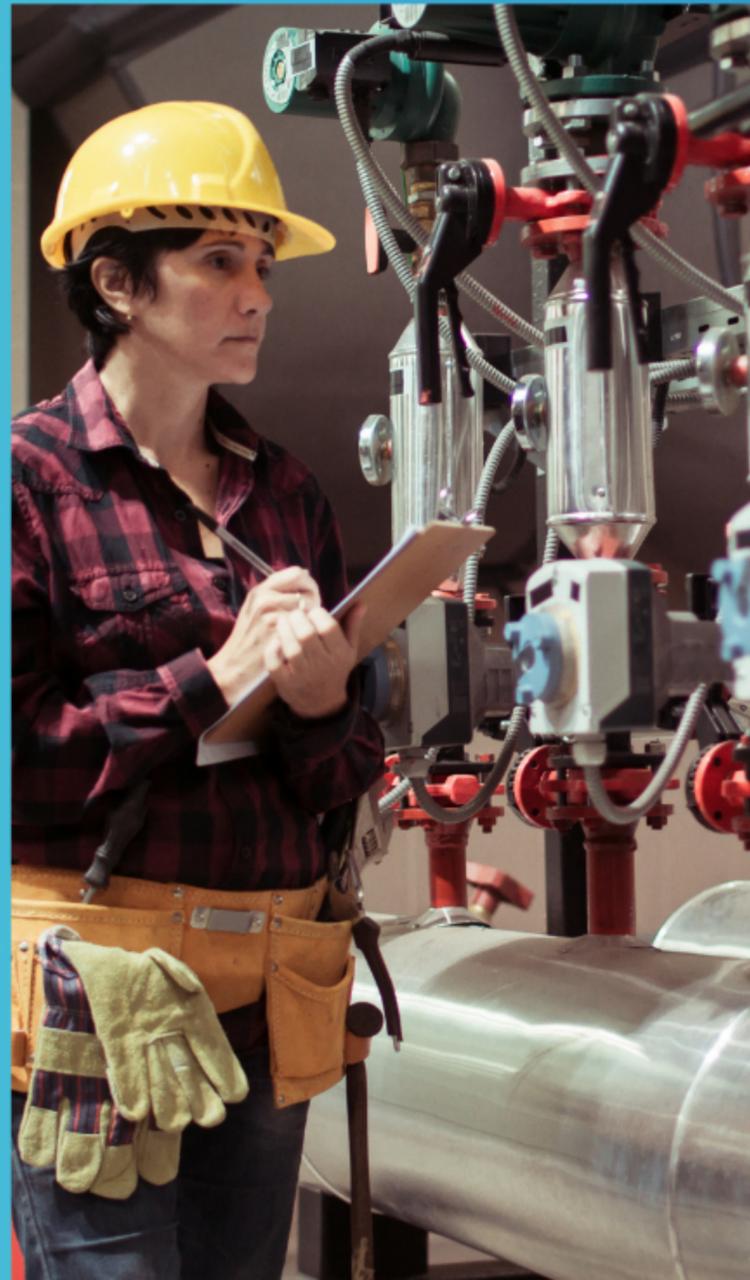




NEBB COMMISSIONING CERTIFIED TECHNICIAN (CXCT) ROLE AND RESPONSIBILITIES

Role of the CxCT

- The NEBB Commissioning Certified Technician (CxCT) is recognized for their expertise in the commissioning process.
- CxCTs work alongside engineers, contractors, and building owners to facilitate the commissioning process.



Responsibilities of a CxCT

- Pre-commissioning activities include reviewing project specifications, understanding owner requirements, and developing a commissioning plan.
- Installation support includes ensuring equipment is installed per specifications.
- Functional testing includes HVAC, plumbing, and electrical systems.
- Reporting includes documenting results, noting deficiencies, and providing corrections.
- Ongoing training and development are necessary to stay updated with the latest technologies and practices.

CERTIFICATION PROCESS

- Candidates must meet specific educational and experience requirements, followed by successful examination.
- Prerequisite experience includes a background in mechanical systems, electrical systems, or a related field.
- Training includes courses on system design, testing procedures, and reporting techniques.
- Examination assesses knowledge and understanding of commissioning principles, techniques, and NEBB standards.

Importance of the CxCT in the Industry

- CxCTs contribute to energy efficiency, occupant comfort, lifecycle costs, and regulatory compliance.
- Their expertise is crucial in achieving high-performance buildings in the evolving built environment.



COMMISSIONING CERTIFIED PROFESSIONAL (CXCP) ROLE AND RESPONSIBILITIES

- Responsible for managing the technical commissioning process of building systems.
- Acts as the owner's advocate, creating required commissioning documents and supervising system commissioning testing.
- Meets pre-requisite requirements, self-directed studying, passing Cx Procedural Standards and Technical exams, and maintaining certification with continuing education.
- CxCP Procedural Standards Exam: 80 multiple choice questions, takes up to two hours to complete.
- The CxCP Technical exam, an open book, consists of 100 multiple choice questions, lasting up to four hours, and is designed to test recall, knowledge application, data interpretation, and problem-solving abilities.



EFFICIENT BUILDING PERFORMANCE IMPORTANCE

- Changes in people's expectations and business environment necessitate efficient building performance.
- The built environment protects health from environmental issues like heat, air pollution, rain, and noise.
- Buildings should not become pollution sources and health hazards.
- Decreased resources like water and energy, and increasing costs of their usage, necessitate better performance.



EFFICIENT BUILDING PERFORMANCE IMPORTANCE+

- Investors expect higher returns on investments, leading to improved building valuation and management models.
- The complexity and automation of building technology necessitates the start-up of individual components and total system operation.
- Major green building certification systems now require HVAC system commissioning, but proper system performance should be a basic requirement for new construction and refurbishment projects.

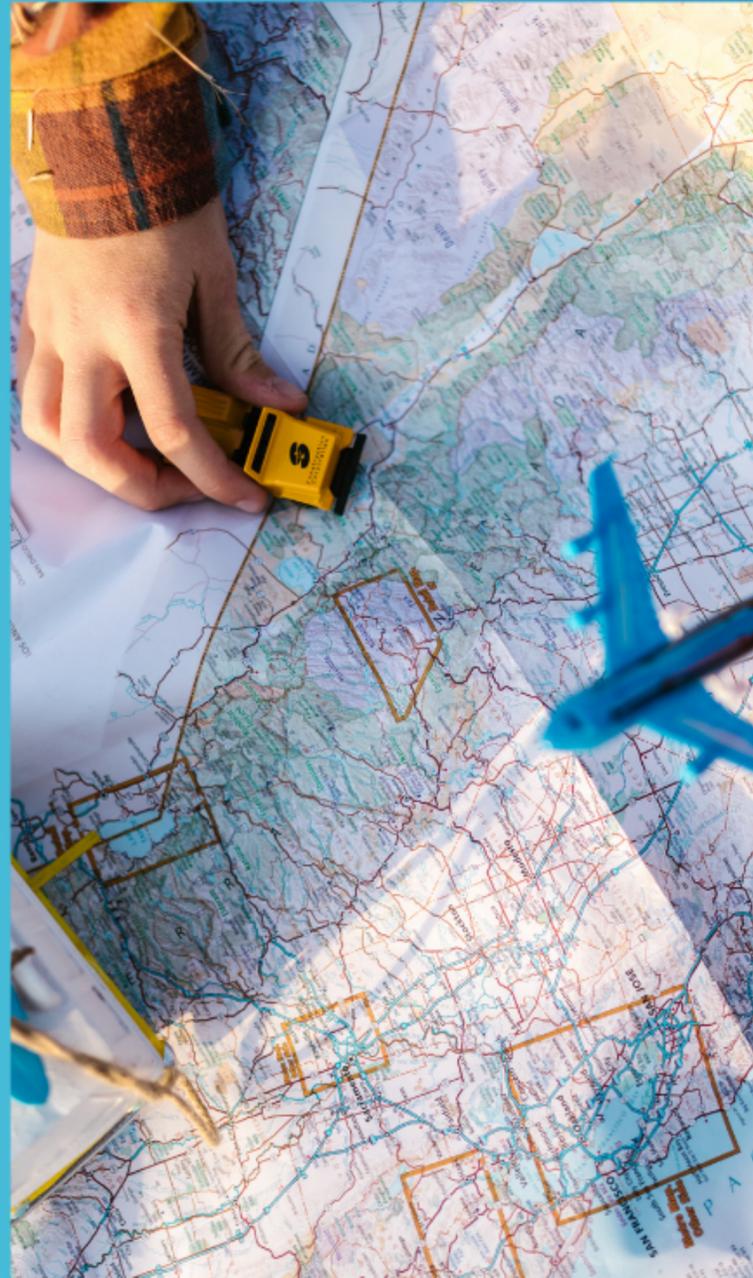




DEFINITION & HISTORY OF COMMISSIONING

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DEFINITION & HISTORY OF COMMISSIONING

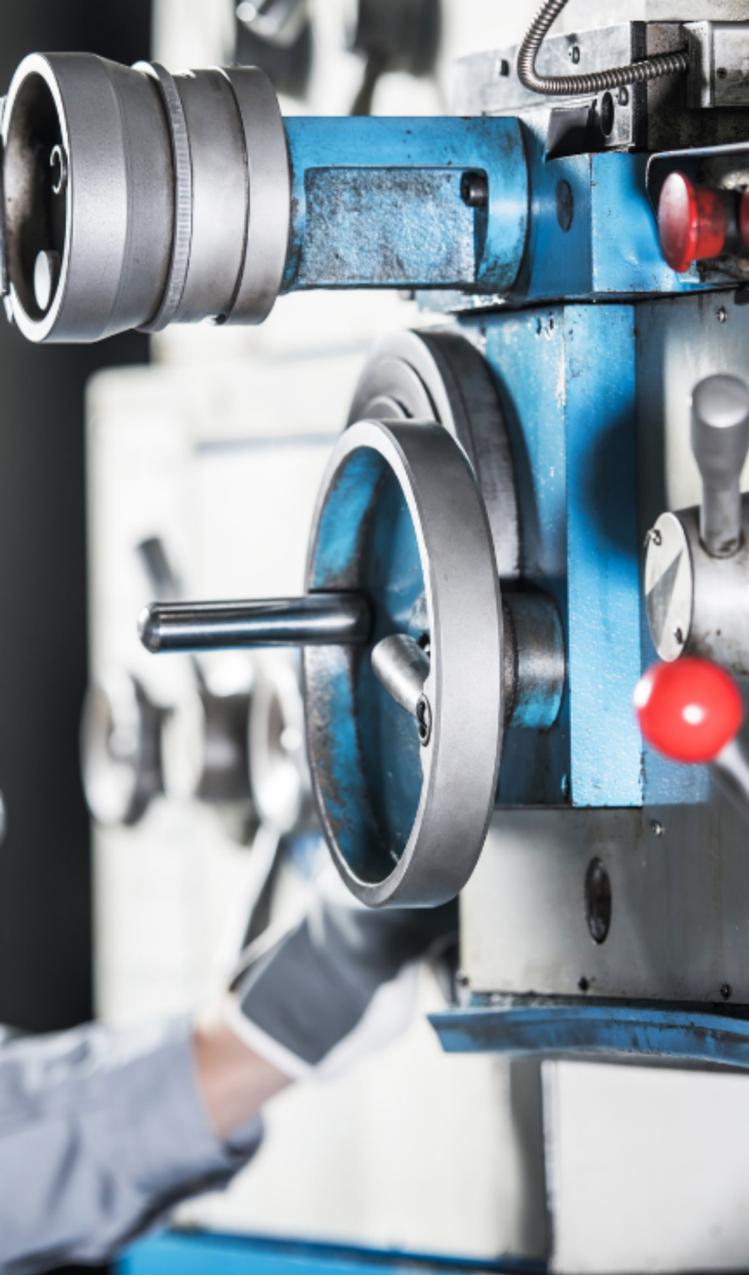


- A systematic process that ensures a building's systems and components are designed, installed, tested, operated, and maintained according to the owner's needs.
- The process includes stages: pre-design, design, construction, occupancy, and operations.
- The evolution of commissioning has been influenced by advancements in building technology and changes in the construction industry.
- Early practices focused on ensuring mechanical systems operated effectively.
- Post-World War II, new technologies and complex building systems necessitated a structured commissioning process.

DEFINITION & HISTORY OF COMMISSIONING +

- The energy crisis in the 1970s led to increased focus on energy efficiency and HVAC system performance.
- By the 1980s, the commissioning process took on a formal structure with the National Institute of Building Sciences establishing guidelines.
- Regulatory changes and standards like ASHRAE Standard 202 and LEED rating system institutionalized the commissioning process.
- Current trends emphasize sustainability, resilience, and occupant health, with concepts like "enhanced commissioning" and "continuous commissioning."
- Technologies like BIM and IoT are increasingly integrated into commissioning practices for real-time monitoring and data-driven decision-making.





MODERN BUILDING SYSTEMS OVERVIEW

- Modern buildings consist of advanced, integrated, and interdependent building systems.
- These systems include visible exterior glazing, concealed interior pipes, wires, ducts, and cables.
- Building systems may consist of sensors, controls, equipment, materials, and subsystems.
- The complexity of building systems has increased due to new building products, smart building designs, stringent safety and sustainability requirements, and increased demand for efficiency and profitability.
- Building systems commissioning is a systematic process facilitated by a commissioning provider (CxP) and a team including the owner, design and construction teams, suppliers, testing agency professionals, and O&M staff.



THE DEFINITION OF COMMISSIONING

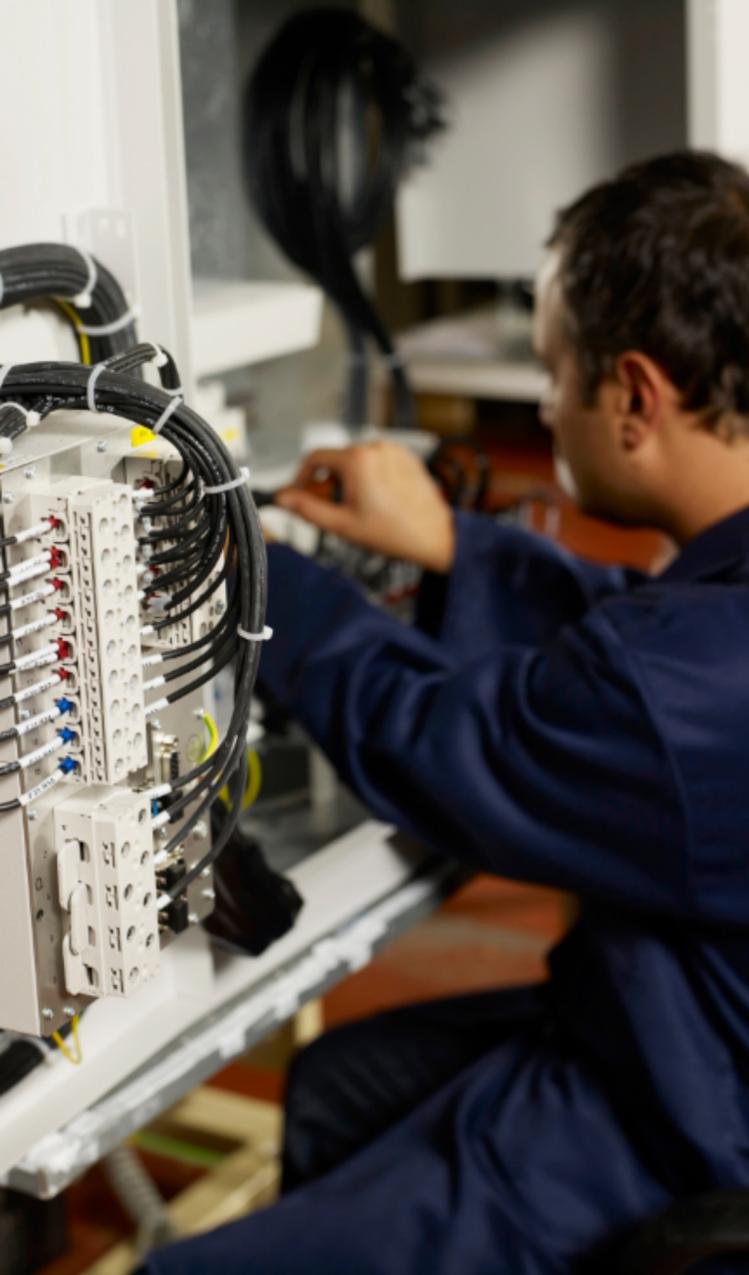
- “The Commissioning Process is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria.” ASHRAE Guideline 0
- “...a systematic, documented, and collaborative process including inspection, testing, and training.”
- “...conducted to confirm that a building and its component system meet the requirements of the occupants and conform to the design intent.”
- “...a quality assurance procedure applied to building construction throughout the entire project...”



HISTORY AND IMPORTANCE OF BUILDING COMMISSIONING



- The building design and construction industry underwent significant refinement in the latter half of the 20th century.
- Phases of project development include predesign, schematic design, design development, construction documents, bidding, construction, warranty, and operation and maintenance.
- The introduction of building commissioning is a recent improvement, despite being in its infancy within the construction industry.
- The complexity of building systems has increased due to stricter energy conservation regulations, safer work environments, advanced phonic, image, video, and data communications technologies, and transforming research and teaching methodologies.



HISTORY AND IMPORTANCE OF BUILDING COMMISSIONING+



- Traditional methods for building start-ups and final acceptance proved inadequate in the 1980s and 1990s.
- Building commissioning was born to shorten or eliminate the stressful break-in period for occupants and operating staff.
- Commissioning has existed for hundreds, if not thousands, of years, possibly starting with the use of watercraft for transportation.
- Modern naval vessels undergo a rigorous commissioning process upon completion of construction to ensure their combat readiness.
- With the introduction of production lines, commissioning lines of equipment became essential to ensure flawless, sequential operation of the associated apparatus.
- The increasing use of commissioning in the bulldozing design and construction industries is a novel concept due to the failure of traditional building start-up methods and the health, safety, and energy consequences of failure.

COMMISSIONING TECHNICIAN ROLE +



- Communication Skills: Effective communication is necessary for conveying technical information and collaborating with diverse teams.
- Examples include overseeing HVAC systems in commercial buildings, complex control systems in industrial settings, and network systems in the IT sector.
- Role helps mitigate risks, enhance operational efficiency, and ensure regulatory compliance.
- The Commissioning Team (Cx Team) is defined by Beyond Smart Cities as the group of professionals who perform commissioning activities or contribute to commissioning deliverables as part of the building systems commissioning process.
- The precise size and composition of the Cx Team will vary from project to project, but typical members include the Commissioning Provider (CxP), the owner or owner's representative, and select members of the design and construction teams.
- Certain operations and maintenance (O&M) personnel are frequently integral members of the CX Team throughout the building systems commissioning process for existing facility projects.

WHO IS A COMMISSIONING AUTHORITY OR SPECIALIST?



- Knowledge of HVAC systems, including design, control strategies, installation, operations, and maintenance.
- Experience in HVAC controls, including current technology.
- Practical field construction background.
- Ability to organize specific activities into a coherent commissioning plan.
- Proficient in documentation and multi-disciplinary team work.
- Familiarity with testing and balancing.

COMMISSIONING TEAM

- The Commissioning Team (Cx Team) is defined by Beyond Smart Cities as the group of professionals who perform commissioning activities or contribute to commissioning deliverables as part of the building systems commissioning process.
- The precise size and composition of the Cx Team will vary from project to project, but typical members include the Commissioning Provider (CxP), the owner or owner's representative, and select members of the design and construction teams.
- Certain operations and maintenance (O&M) personnel are frequently integral members of the CX Team throughout the building systems commissioning process for existing facility projects.
- In today's construction industry, the term "commissioning team" (or "CX team") is commonly understood to refer to the key parties who collaborate on a project to implement the commissioning process.
- However, this term is not universally accepted, so ANSI/ASHRAE/IES Standard 202-2018: Commissioning Process for Buildings and Systems does not employ it.



KEY DEFINITION & MEANING



Commissioning is a process - a systematic process of ensuring that a building performs in accordance with the design intent, contract documents, and the owner's operational needs.

Basis of Design (BOD)

A document that records the concepts, calculations, decisions, and product selections used to meet the owner's project requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.





ASHRAE: American Society of Heating Refrigerating and Air-Conditioning Engineers is an international organization with a mission of advancing heating, ventilation, air conditioning and refrigeration to serve humanity and promote a sustainable world through research, standards writing, publishing and continuing education.

Building Performance Monitoring & Metric: Using tools that compile building data into a few useful metrics to help operators understand whether their building technology is working as intended.

Owner's Project Requirements (OPR)

A written document that details the functional requirements of a project, i.e., the expectations of how it will be used and operated, It also includes project goals, measurable performance criteria (e.g., energy efficiency goals), cost considerations, success criteria and relevant benchmarks, and supporting information.



Commissioning Process (CxP): A quality-focused process for enhancing the delivery of a project includes commissioning process activities specified by the owner or required by a code or standard. The process focuses on verifying and documenting that all of the systems and assemblies under the scope of commissioning are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements.

Commissioning Final Report (CxFR): A document that records the activities and results of the commissioning process and is developed from the final commissioning plan with all of its attached appendices.

Commissioning Plan (CxPlan) : A dynamic document that outlines the organization, schedule of activities, allocation of resources, and documentation requirements of the commissioning process. The document shall be updated frequently, at least at the end of every phase, with the tasks and documents related to the coming phase.

Commissioning Provider (or Authority (CxA) or Agent): An organization or individual identified by the owner who sets up the commissioning team and leads, plans, schedules, and coordinates the activities to implement the commissioning process.

Commissioning Team (Cx Team) : Individuals and agencies who, through coordinated actions, are responsible for implementing the commissioning process.



WELCOME TO BEYOND SMART CITIES

Beyond Smart Cities is the world's 1st Green Technology Marketplace, connecting millions of Sustainability Specialists, Green Building Specialists, Energy Specialists, Commissioning Specialists, Environment Specialists, Health & Safety Specialists, Fire Safety Specialists, Climate Change Specialists & Green Products/Technology Manufacturers with independent talent around the globe.

Our mission is to build and support a global community of experts with the highest professional standards in sustainability, green building, energy, commissioning, environment, health & safety, fire safety, climate change, GHG accounting, carbon auditing, and GHG emissions management.

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