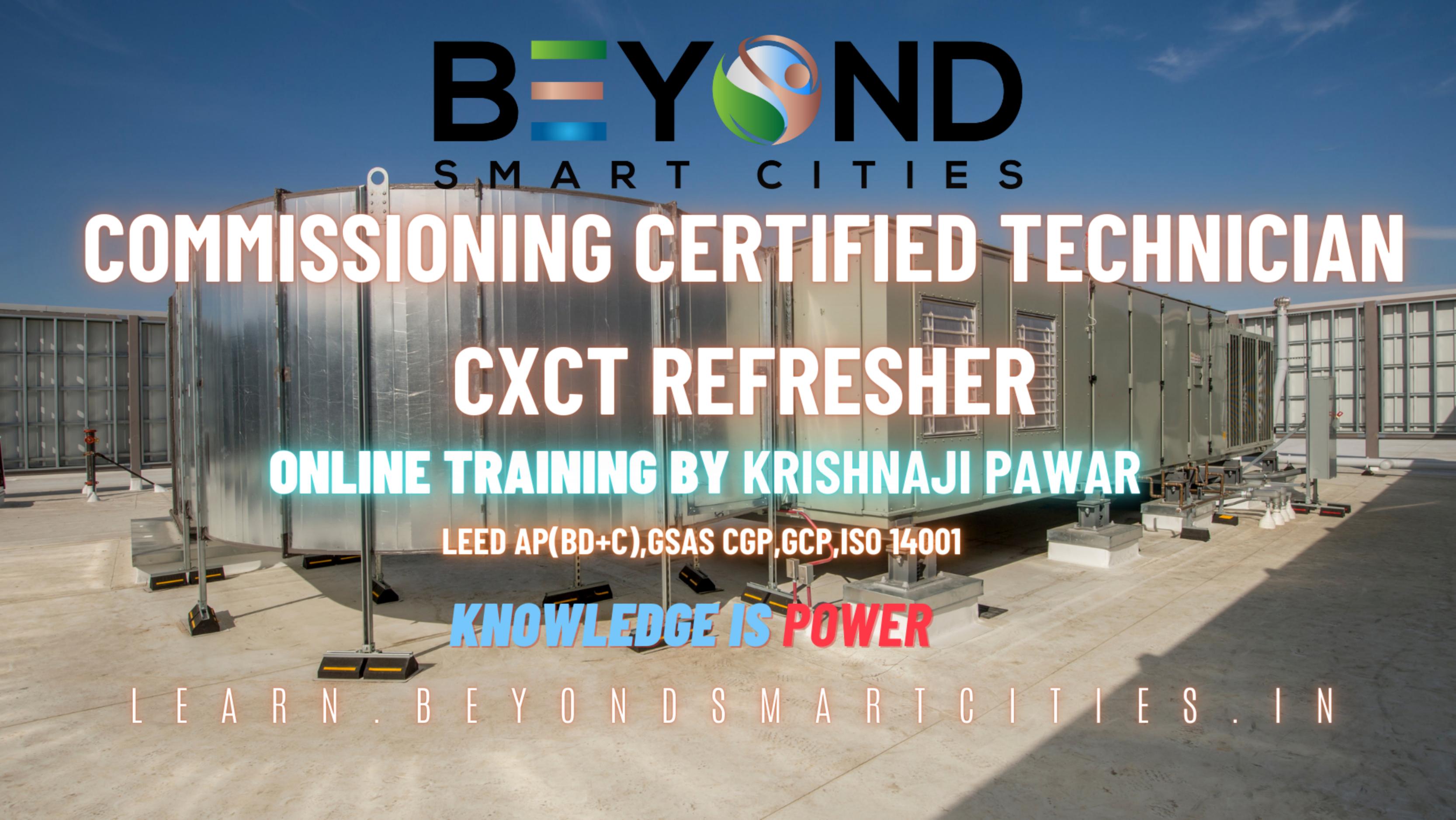


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MODULE
7L1

Point-to-point Calibrate MEP & Sensor Systems

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Point-to-point calibration is a systematic process used to ensure accurate and reliable readings in measurement and evaluation procedures (MEP) and sensor systems. It involves comparing the output of a sensor or measuring device to a known reference standard, aiming to establish a relationship between the measured values and the true values. Point-to-point calibration focuses on specific points within the sensor's operating range rather than across its entire range.

Learning Objectives

- Course Overview and Introduction
- CCxT's Technical, Communication, and Commissioning Skills - Working knowledge of Procedural Standards
- HVAC Systems - Why is CxA of buildings necessary?
- Basics of field TAB , HVAC systems - Trained on jobsite safety and PPE
- CxT Responsibilities - Post Acceptance
- Perform installation pre-functional tests
- Point-to-point calibrate MEP and sensor systems.
- Verify TAB pre-functional tests and CxT responsibilities



INTRODUCTION

- Point-to-point calibration is a systematic process used to ensure accurate and reliable readings in measurement and evaluation procedures (MEP) and sensor systems.
- It is crucial in fields like engineering, environmental monitoring, medical diagnostics, and industrial automation.
- Calibration involves comparing the output of a sensor or measuring device to a known reference standard.

UNDERSTANDING THE CALIBRATION PROCESS



- Defines calibration points: specific values at which the sensor will undergo testing.
- Selects reference standards: a device or measurement known to produce accurate results.
- Performs the calibration: takes measurements at each defined point using both the sensor and the reference standard.
- Data Collection: Record the output from the sensor and the corresponding output from the reference standard at the same calibration point.
- Replicates Measurements: Takes multiple measurements at each point and calculates the mean value.
- Data Analysis: Compares the sensor readings with the reference standard output.
- Adjustments and Correction: If the calibration error exceeds acceptable limits, adjustments may be necessary.
- Documentation: Essential for traceability and quality assurance.

POINT-TO-POINT TESTING OF HVAC CONTROL SYSTEMS

- Point-to-point testing is a crucial phase in HVAC control system commissioning and maintenance.
- It ensures all components function as intended and communicate effectively within the system.

Objectives of Point-to-Point Testing

- **Verification of Control Logic:** Ensures control signals from the central controller reach terminal devices without interruption.
- **System Components Calibration:** Verifies the accurate calibration of sensors and actuators for precise operation.
- **Assessment of Installation Quality:** Evaluates the physical installation of components to ensure they adhere to industry standards.
- **Documentation for Future Reference:** Provides a comprehensive record of the testing process and results for ongoing maintenance and troubleshooting.



COMMON HVAC CONTROLS



- Terminal Units: Regulate airflow and temperature within individual building zones.
- Air Handling Units (AHUs): Condition and circulate air as part of the HVAC system.
- Pumps: Essential for circulating chilled or hot water through the system.
- Exhaust Fans (EFs): Crucial for maintaining indoor air quality.

POINT-TO-POINT TESTING PROCESS

- Preparation of Test Equipment: Ensures all necessary tools and equipment are available and calibrated.
- Mapping the Control System: Creates a detailed schematic of the HVAC control system.
- Visual Inspection: Performs a thorough visual inspection of all control wiring.
- Testing Control Signals: Verifies the signal from the building management system (BMS) to the VAV actuator.
- Sensor Calibration: Ensures temperature sensors, pressure sensors, and flow meters are calibrated according to manufacturer specifications.
- Actuator Testing: Manually triggers actuators to verify their correct response.
- Verification of Component Interactions: Performs tests to ensure components work in conjunction.
- Documentation of Findings: Maintains detailed records of all tests.



CALIBRATION AND INSTALLATION CONSIDERATIONS



- Understanding System Component Calibrations: Ensures sensors and actuators provide accurate readings and operate within their specified ranges.
- Proper Location: Positions sensors and control devices away from direct sunlight or hot air drafts.
- Proper Installation Methods: Components must be installed according to manufacturer guidelines and industry standards.

DEFINITION AND IMPORTANCE OF SENSOR CALIBRATION

- Sensor calibration is crucial for accurate and reliable measurements.
- It involves comparing a sensor's output against a known reference standard to determine its accuracy.
- It's important in fields like environmental monitoring, industrial automation, and healthcare.



THE CALIBRATION PROCESS

Step 1: Selecting the Measuring Instrument

- The instrument must have a higher accuracy than the sensor being calibrated.
- Example: A reference thermometer with an accuracy of $\pm 0.1^{\circ}\text{C}$ or better is recommended for a temperature sensor with an accuracy of $\pm 0.5^{\circ}\text{C}$.

Step 2: Measuring and Collecting Data

- Measurements are taken at defined points across the sensor's operational range.
- Consistent environmental conditions are maintained to minimize external influences.





THE CALIBRATION PROCESS +

Step 3: Calculating the BAS Offset

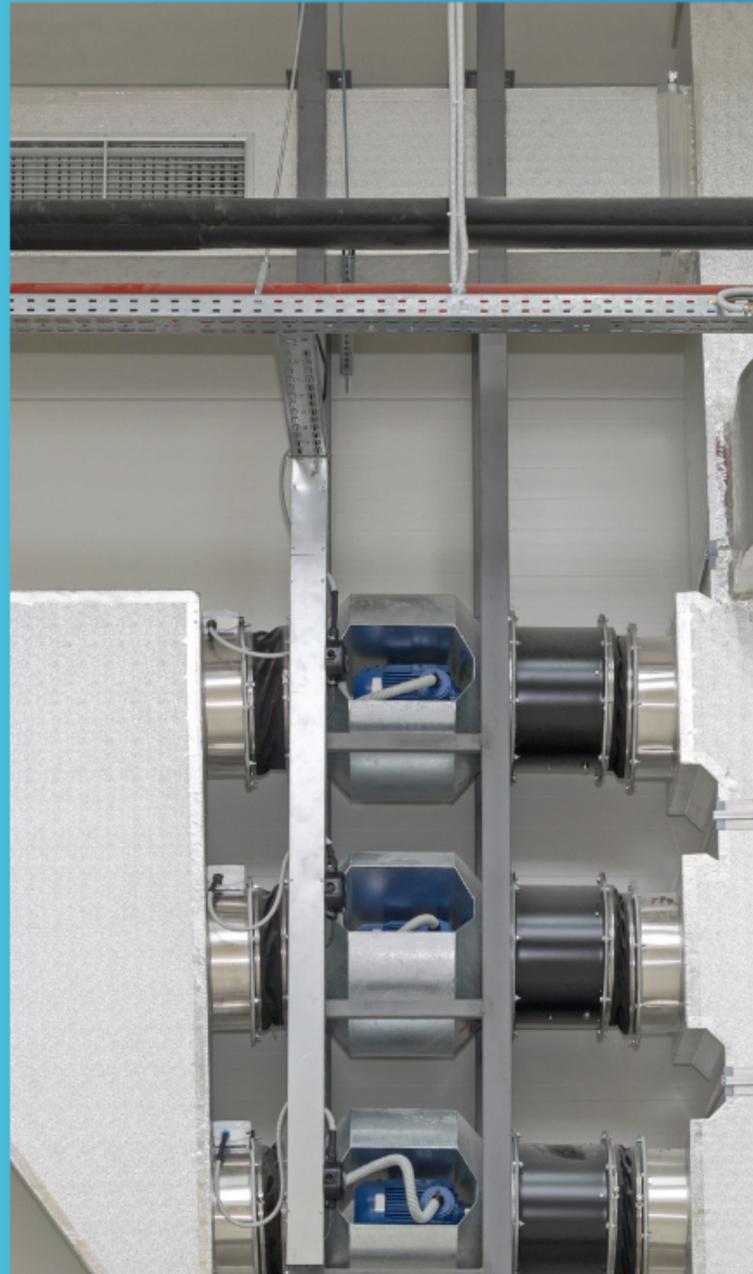
- The BAS (Base Accuracy Standard) offset is calculated by comparing the sensor's readings to those of the reference standard at each measurement point.

Step 4: Comparing the BAS Reading to the Actual Reading

- A correction curve or calibration table is created to visualize the sensor's performance.
- The adjusted readings align with the reference values, demonstrating the sensor can be corrected for accurate measurements.

Step 5: Determining Compliance Based on Specified Tolerances

- The adjusted readings must be evaluated against specified tolerances to determine compliance.
- If any reading falls outside the specified tolerance, further adjustment or recalibration of the sensor is necessary.



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