



National Environmental Balancing Bureau

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NEBB-ASHRAE eLearning Course Descriptions for Technical Training E-Learning Courses

Commissioning Testing Technician Training

Is comprised of two segments totaling 12 online modules: HVAC, comprised of four online modules, and Controls Courses, comprised of eight online modules that are taken in sequential order. Full descriptions of each module's learning objectives within the Commissioning Testing Technician Training course is listed below with the specific number of continuing education credit hours listed. *Call 301-977-3698 to order this training course and to receive a discount from standard ASHRAE pricing.*

The Commissioning Testing Technician Training is approved for a total of 55 NEBB CECs.

HVAC Courses Segment (four modules)

1. Introduction to HVAC Control Systems

This module introduces control theory and explains how evaluate, select, position and sequence the appropriate type of control. After completing this module, you will be able to:

- Define the components of the control loop
- Identify open loop and closed loop controls
- Recognize the relationship between gain and throttling range.
- Recognize how two-position, floating, and modulating control loops function
- Determine the appropriate type of control mode for select situations
- Understand the mechanism of action for floating control loops
- Know the definitions for terms related to proportional plus integral plus derivative (PID) control logic
- Identify the concept of fuzzy logic
- Recognize the difference between direct acting and reverse acting controls
- Identify fundamentals of control position and sequencing

This module is approved by AIA, GBCI & ASHRAE. **4.5 CECs**

2. Thermal Comfort

This module will provide you with an understanding of the factors determining thermal comfort. It also covers the comfort envelope, necessary for designing systems that operate within acceptable ranges.

Upon completion of this module you will be able to:

- Identify the seven factors that influence thermal comfort
- Explain how thermal conditions and the individual influence thermal comfort
- Choose acceptable thermal design conditions

This module is approved by AIA, GBCI & ASHRAE. **2.0 CECs**

3. Ventilation and IAQ

This module will provide you with an understanding of the types, sources and effects of air contaminants and how to control them, as well as the basic concepts of ASHRAE Standard 62.1 Upon completion of this module you will be able to:

- Identify types and sources of indoor air contaminants and pollutants
- Comprehend the effects of pollutants and contaminants on health
- Comprehend the basic concepts of the ASHRAE Ventilation Standard 62.1-2004

This module is approved by AIA, GBCI & ASHRAE. **3.0 CECs**

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4. Hydronic Systems

This module shows the components, strengths and weaknesses of hydronic systems, the effects of varying water flow, and considerations for effective ventilation.

Upon completion of this module you will be able to:

- Describe natural convection and low temperature radiation heating systems
- Identify the benefits and
- Weaknesses of natural convection and low temperature radiation heating systems
- Recognize the effects of varying water flow and temperature in controlling water heaters
- Comprehend the ventilation options for hydronic heating systems

This module is approved by AIA, GBCI & ASHRAE. **2.5 CECs**

Controls Courses Segment (consists of 8 modules)

1. Energy Conservation

This module discusses advanced techniques for energy conservation.

Upon completion of this module you will understand:

- The environmental benefits of using renewable energy sources
- Passive versus active renewable energy
- Types of solar energy utilization
- Methods to use reclaimed or recovered water in buildings

This module is approved by AIA, GBCI & ASHRAE. **8.5 CECs**

2. Special Applications

In this module, you will learn about radiant heating and cooling, thermal storage, room air distribution and humidity control

- Upon completion of this module you will be able to:
- Identify applications for radiant heating and cooling.
- Recognize the advantages of radiant heating and cooling.
- Recognize the issues related to ceiling radiant cooling.

This module is approved by AIA, GBCI & ASHRAE. **4.0 CECs**

3. Introduction to HVAC Control Systems

This module introduces control theory and explains how evaluate, select, position and sequence the appropriate type of control. After completing this module, you will be able to:

- Define the components of the control loop
- Identify open loop and closed loop controls
- Recognize the relationship between gain and throttling range.
- Recognize how two-position, floating, and modulating control loops function
- Determine the appropriate type of control mode for select situations
- Understand the mechanism of action for floating control loops
- Know the definitions for terms related to proportional plus integral plus derivative (PID) control logic
- Identify the concept of fuzzy logic
- Recognize the difference between direct acting and reverse acting controls
- Identify fundamentals of control position and sequencing

This module is approved by AIA, GBCI & ASHRAE. **4.5 CECs**

4. Basics of Electricity

This module provides the electrical knowledge needed to understand controls and the use of electrical circuit drawings. After completing this module, you will be able to:

- Apply basic electricity concepts to simple electrical circuits
- Calculate volts, watts, and amps using Ohm's law and the Power law
- Calculate voltage for resistances in series
- Calculate combined resistance for resistances in parallel
- Recognize the effect of capacitors and inductors on current and on voltage
- Recognize the configuration of 3-phase, 4-wire service
- Comprehend the use and function of relays
- Apply basic electricity concepts to simple electrical circuits.
- Recognize how motor starters function
- Identify the advantages for variable speed drives for fans
- Identify relay logic using electrical circuit drawing

This module is approved by AIA, GBCI & ASHRAE. **4.5 CECs**

5. Control Valves and Dampers

This module teaches the various types of valves and dampers, and their selection, installation and operation. After completing this module, you will be able to:

- Identify valve parts and valve types
- Select valves based on their characteristics for various applications
- Discriminate between 2-way and 3-way valve characteristics and performance
- Calculate pressure drop and the valve flow coefficient.
- Recognize the types and appropriate uses of dampers for air flow control in various applications
- Understand damper leakage ratings and how they are used
- Determine damper pressure drops
- Determine damper size

This module is approved by AIA, GBCI & ASHRAE. **6.5 CECs**

6. Sensors and Auxiliary Devices

This module teaches the terminology and attributes of sensors, the selection of moisture sensors, pressure, flow, and auxiliary devices. After completing this module, you will be able to:

- Recognize:
 - The various types of temperature sensors
 - The various types of moisture sensors
 - How differential pressure is sensed
 - The use of auxiliary devices common to control systems
- Select:
 - Temperature sensors based on their features and parameters
 - Air and water flow sensors for the HVAC applications for which they are best suited
 - Moisture sensors based on their features and parameters
- Use the psychrometric chart to assess moisture and energy load
- Understand the process of interpreting data to determine if a sensor is working properly
- Identify terms related to pressure and its measurement

This module is approved by AIA, GBCI & ASHRAE. **7.5 CECs**

7. Control Diagrams and Sequences

This module explains the use of written specifications, schedules, and drawings to clearly identify what is to be installed, how it is to be installed, and how it is expected to operate.

After completing this module, you will be able to:

- Apply design concepts that will result in a workable and flexible control systems
- Recognize the responsibilities of the various designers and contractors in the typical control system design and construction process.
- Interpret a control diagram using standard symbols.
- Interpret guidelines for writing a control sequence.

This module is approved by AIA, GBCI & ASHRAE. **3.5 CECs**

8. DDC Specification, Installation and Commissioning

Understanding interoperability of controllers, network and data protocols with an introduction to BACnet and LonWorks

After completing this module, you will be able to:

- Recognize advantages and challenges of DDC systems
- Comprehend the DDC design process
- Be aware of a number of interoperability and bidding issues

This module is approved by AIA, GBCI & ASHRAE. **4.5 CECs**

**For those interested in becoming certified as a Commissioning Certified Technician (CxCT), contact NEBB at certification@nebb.org to obtain a CxCT Application for Candidacy and full details on this certification program.*

BSC (Cx) Training

Is comprised of six (6) online modules that are taken in sequential order. Full descriptions of each module's learning objectives within the BSC (CX) course is listed below with the specific number of continuing education credit hours listed. **Call 301-977-3698 to order this training course and to receive a discount from standard ASHRAE pricing.**

The BSC (Cx) Training is approved for a total of 27 NEBB CECs.

1. Introduction to HVAC Systems

This module will provide you with an understanding of simple psychrometric charts and how to use them. It also provides a description of basic system components and operation of the economizer cycle.

Upon completion of this module, you will be able to:

- Identify terms used in the psychrometric charts
- Identify important components of the psychrometric charts
- Plot conditions on the psychrometric charts
- Use the psychrometric charts to interpret data

This module is approved by AIA, GBCI & ASHRAE. **3.5 CECs**

2. Sensors and Auxiliary Devices

This module teaches the terminology and attributes of sensors, the selection of moisture sensors, pressure, flow, and auxiliary devices. After completing this module, you will be able to:

- Recognize:
 - The various types of temperature sensors
 - The various types of moisture sensors
 - How differential pressure is sensed
 - The use of auxiliary devices common to control systems

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- Select:
 - Temperature sensors based on their features and parameters
 - Air and water flow sensors for the HVAC applications for which they are best suited
 - Moisture sensors based on their features and parameters
- Use the psychrometric chart to assess moisture and energy load
- Understand the process of interpreting data to determine if a sensor is working properly
- Identify terms related to pressure and its measurement

This module is approved by AIA, GBCI & ASHRAE. **7.5 CECs**

3. Control Diagrams and Sequences

This module explains the use of written specifications, schedules, and drawings to clearly identify what is to be installed, how it is to be installed, and how it is expected to operate. After completing this module, you will be able to:

- Apply design concepts that will result in a workable and flexible control systems
- Recognize the responsibilities of the various designers and contractors in the typical control system design and construction process.
- Interpret a control diagram using standard symbols.
- Interpret guidelines for writing a control sequence.

This module is approved by AIA, GBCI & ASHRAE. **3.5 CECs**

4. DDC Introduction to Hardware and Software

This module introduces control theory and explains how evaluate, select, position and sequence the appropriate type of control. After completing this module, you will be able to:

- Define the components of the control loop
- Identify open loop and closed loop controls
- Recognize the relationship between gain and throttling range.
- Recognize how two-position, floating, and modulating control loops function
- Determine the appropriate type of control mode for select situations
- Understand the mechanism of action for floating control loops
- Know the definitions for terms related to proportional plus integral plus derivative (PID) control logic
- Identify the concept of fuzzy logic
- Recognize the difference between direct acting and reverse acting controls
- Identify fundamentals of control position and sequencing

This module is approved by AIA, GBCI & ASHRAE. **4.5 CECs**

5. DDC Networks and Protocols

With this module, you will understand the interoperability of controllers, network and data protocols. It also provides an introduction to BACnet and LonWorks. After completing this module, you will be able to:

- Comprehend network components, how they influence information flow, and how they relate to each other within a system
- Recognize the interoperability issues within systems and between their components
- Identify the common network standards used in HVAC and their limitations.
- Recognize the significance of information protocols
- Identify the components of BACnet and LonWorks
- Identify the difference between BACnet and LonWorks
- Identify how BACnet and LonWorks can work on the same network.

This module is approved by AIA, GBCI & ASHRAE. **3.5 CECs**

6. DDC Specification, Installation and Commissioning

Understanding interoperability of controllers, network and data protocols with an introduction to BACnet and LonWorks
After completing this module, you will be able to:

- Recognize advantages and challenges of DDC systems
- Comprehend the DDC design process
- Be aware of a number of interoperability and bidding issues

This module is approved by AIA, GBCI & ASHRAE. **4.5 CECs**

Retro Commissioning (RCx Training)

Is comprised of six (6) online modules that are taken in sequential order. Full descriptions of each module's learning objectives within the Retro Commissioning Training is listed below with the specific number of continuing education credit hours listed. ***Call 301-977-3698 to order this training course and to receive a discount from standard ASHRAE pricing.***

The Retro Commissioning Training is approved for a total of 17 NEBB CECs.

1. Introduction to HVAC Systems

This module will provide you with an understanding of simple psychrometric charts and how to use them. It also provides a description of basic system components and operation of the economizer cycle.

Upon completion of this module, you will be able to:

- Identify terms used in the psychrometric charts
- Identify important components of the psychrometric charts
- Plot conditions on the psychrometric charts

Use the psychrometric charts to interpret data

This module is approved by AIA, GBCI & ASHRAE. **3.5 CECs**

2. Electric Controls

This module provides instruction on introduction to electric controls, control diagrams and control logic.
After completing this module, you will be able to:

- Recognize how bridge circuits are used to provide modulating electric controls
- Have an understanding of the range of actuators and their auxiliary devices available to drive valves and dampers
- Comprehend how one can trace around a simple control drawing

This module is approved by AIA, GBCI & ASHRAE. **2.0 CECs**

3. Pneumatic Controls

This module provides instruction on the components of pneumatic systems and control applications diagrams.

- After completing this module, you will be able to:
- Recognize terms related to pressure and its measurement
- Recognize how bleed and non-bleed thermostats and controllers operate
- Comprehend the range of components available in pneumatic controls
- Be familiar with common HVAC pneumatic control applications diagrams

This module is approved by AIA, GBCI & ASHRAE. **3.0 CECs**

This module is approved by AIA, GBCI & ASHRAE. **1.5 CECs**

5. Control Diagrams and Sequences

This module explains the use of written specifications, schedules, and drawings to clearly identify what is to be installed, how it is to be installed, and how it is expected to operate.

After completing this module, you will be able to:

- Apply design concepts that will result in a workable and flexible control systems
- Recognize the responsibilities of the various designers and contractors in the typical control system design and construction process.
- Interpret a control diagram using standard symbols.
- Interpret guidelines for writing a control sequence.

This module is approved by AIA, GBCI & ASHRAE. **3.5 CECs**

6. DDC Networks and Protocols

With this module, you will understand the interoperability of controllers, network and data protocols. It also provides an introduction to BACnet and LonWorks.

After completing this module, you will be able to:

- Comprehend network components, how they influence information flow, and how they relate to each other within a system
- Recognize the interoperability issues within systems and between their components
- Identify the common network standards used in HVAC and their limitations.
- Recognize the significance of information protocols
- Identify the components of BACnet and LonWorks
- Identify the difference between BACnet and LonWorks
- Identify how BACnet and LonWorks can work on the same network.

This module is approved by AIA, GBCI & ASHRAE. **3.5 CECs**