Mechanical Electrical Control Systems

SERIES SPECIFICATIONS & COURSE OUTLINE

 CONTENTS
This electrical maintenance series is designed to help participants use schematics to design, modify, troubleshoot, and repair building mechanical electrical control systems. The series covers reading and creating schematics, electrical lockout, energy management, specialized control system functions, and troubleshooting techniques.

 AUDIENCE
The Mechanical Electrical Control Systems series is designed for individuals who have a basic understanding of building mechanical control systems including HVAC. Emphasis is placed on how to work with new or custom control systems with minimal documentation or with detailed electrical schematics.

 LEARNER EXPECTATIONS
This series is intended to be used as an essential component in your facility’s mechanical controls maintenance program. It is designed to provide the background knowledge necessary to develop an in-depth understanding of control systems and their schematics. Each lesson has specific objectives that identify the anticipated level of understanding associated with the information presented. Our experience indicates that those who complete the training are likely to accomplish the stated objectives. Furthermore, if these lessons are built into a total curriculum which includes practice in the working environment, it will help provide participants with the knowledge necessary to master the subject.
**MEC001 Introduction to Control Schematics**  
**Purpose:** This course introduces the fundamentals of working with schematics for control systems. It provides participants with a basic understanding of schematic symbols.  
**Objectives:** Understand how a schematic differs from a wiring diagram or component arrangement; discuss the advantages of using a schematic for design and troubleshooting; and recognize symbols commonly used in control system schematics.

**MEC002 Creating Schematics**  
**Purpose:** This course demonstrates the method for creating a simplified schematic from a complex wiring diagram or component arrangement.  
**Objectives:** Use available information to draw a schematic; discuss the difference between branching circuits and return legs; and use the schematic to understand the workings of an unfamiliar system.

**MEC003 Electrical Lockout**  
**Purpose:** This course uses schematics to show how electrical lockout protects mechanical systems at the controls level.  
**Objectives:** Recognize electrical lockout circuits in a schematic; understand how the lockout circuit protects a particular system; trace the cause of the lockout; and discuss the difference between automatic reset and manual reset and appropriate uses of each.

**MEC004 Design & Troubleshooting**  
**Purpose:** This course shows how schematics are used to design a system according to a set of specifications and how to troubleshoot a design.  
**Objectives:** Determine specifications for a control system; use those specifications to design a schematic; discuss various methods of meeting a set of specifications; and use a schematic to troubleshoot a control system design.

**MEC005 Energy Management**  
**Purpose:** This course introduces the concept of energy management and describes its importance in commercial and industrial control systems. It describes energy management as a function of the control system and demonstrates different types of energy management principles and controls.  
**Objectives:** Discuss the importance of energy management in an electrical control system; demonstrate basic energy management principles; and incorporate energy management functions in a control system design.

**MEC006 Electronic Controls**  
**Purpose:** This course shows how complex systems such as two-stage heating/two-stage cooling may be understood through schematics. It introduces the use of electronics, including “black boxes” or logic controls as part of the control system.  
**Objectives:** Use schematics to understand more intricate control systems; discuss the growing use of computer-controlled systems; and diagnose computer control problems using flow charts.

**MEC007 Responsive Systems**  
**Purpose:** This course describes mechanical control systems which respond to activities in and around a building. These systems may control environmental functions such as lighting and climate control or specific tasks including security, conveniences, or access.  
**Objectives:** Discuss the various “response” situations and controls needed in commercial and industrial buildings; identify the specific requirements of a building or area; and use schematic designs to fulfill those requirements through control systems.