Industrial Maintenance: Industrial Electrical & Instrumentation Technical

- **00101-09 Basic Safety**
  Explains the safety obligations of workers, supervisors, and managers to ensure a safe workplace. Discusses the causes and results of accidents and the dangers of rationalizing risk. Reviews the role of company policies and OSHA regulations in maintaining a safe workplace. Introduces common job-site hazards and protections such as lockout/tagout, personal protective equipment (PPE), and HazCom.

- **00102-09 Introduction to Construction Math**
  Reviews basic mathematical functions such as adding, subtracting, dividing, and multiplying whole numbers, fractions, and decimals, and explains their applications to the construction trades. Explains decimal-fraction conversions and the metric system using practical examples. Also reviews basic geometry as applied to common shapes and forms.

- **00103-09 Introduction to Hand Tools**
  Introduces trainees to hand tools that are widely used in the construction industry, such as hammers, saws, levels, pullers, vises, and clamps. Explains the specific applications of each tool and shows how to use them properly. Also discusses important safety and maintenance issues related to hand tools.

- **00104-09 Introduction to Power Tools**
  Provides detailed descriptions of commonly used power tools such as drills, saws, grinders, and sanders. Reviews applications, proper use, safety, and maintenance. Many illustrations show power tools used in on-the-job settings.

- **00105-09 Introduction to Construction Drawings**
  Covers construction drawings, components, and symbols. Discusses different types of drawings and describes how to interpret and use drawing dimensions. Four oversized drawings are included.

- **00106-09 Basic Rigging**
  Explains how ropes, chains, hoists, loaders, and cranes are used to move material and equipment from one location to another on a job site. Describes inspection techniques and load-handling safety practices. Also reviews American National Standards Institute (ANSI) hand signals.

- **00107-09 Basic Communication Skills**
  Provides trainees with techniques for communicating effectively with co-workers and supervisors. Includes practical examples that emphasize the importance of verbal and written information and instructions on the job. Also discusses effective telephone and e-mail communication skills.

- **00108-09 Basic Employability Skills**
  Identifies the roles of individuals and companies in the construction industry. Introduces trainees to critical thinking and problem solving skills and computer systems and their industry applications. Also reviews effective relationship skills, effective self-presentation, and key workplace issues such as sexual harassment, stress, and substance abuse.

- **00109-09 Introduction to Material Handling**
  Describes hazards associated with materials handling and safe materials handling techniques and procedures. Introduces materials handling equipment for common job-site tasks.

LEVEL ONE

- **40101-07 Orientation to the Trade**

Covers the history of the trade, and the kinds of work and work environments industrial maintenance craftspeople would find in the field. Describe the apprenticeship and training programs available, as well as the career opportunities in industrial maintenance. The responsibilities and characteristics a worker should possess are also described.

- **40102-07 Tools of the Trade**

Provides an introduction to the hand and power tools used in industrial maintenance. Covers safety procedures and techniques for use of these tools.

- **40103-07 Fasteners and Anchors**

Covers the hardware and systems used by an industrial maintenance craftsperson. Describes various types of anchors and supports, their applications, and how to install them safely.

- **40104-07 Oxyfuel Cutting**

Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Includes straight line cutting, piercing, beveling, washing, and gouging.

- **40105-07 Gaskets and Packing**

Introduces types of gaskets and gasket material, types of packing and packing material, and types of O-ring material. Explains the use of gaskets, packing, and O-rings, and teaches how to fabricate a gasket.

- **40106-07 Craft-Related Mathematics**

Explains how to use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

- **40107-07 Construction Drawings**

Introduces the trainee to plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, basic circuit diagrams, and detail sheets.

- **40108-07 Pumps and Drivers**

Explains centrifugal, rotary, reciprocating, metering, and vacuum pump

operation and installation methods, as well as types of drivers. Also covers net positive suction head and cavitation.

- **40109-07 Introduction to Valves**

Identifies and provides installation methods for different types of valves. Also covers valve storage and handling.

- **40110-07 Introduction to Test Equipment**

Introduces the basic test equipment for industrial maintenance, including tachometers, pyrometers, strobe meters, voltage testers, and automated diagnostic tools.

- **40111-07 Material Handling and Hand Rigging**

Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

- **40112-07 Mobile and Support Equipment**

Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, manlifts, compressors, and generators.

- **40113-07 Lubrication**

Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

LEVEL TWO

- **40201-08 Industrial Safety for E&I Technicians**

Covers safety and regulations for electrical workers, the necessary precautions to take for various electrical hazards found on the job, and the OSHA-mandated lockout/tagout procedure.

- **40202-08 Introduction to the National Electrical Code**

Provides a navigational road map for using the NEC. Introduction the layout of the NEC and the types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

- **40203-08 Electrical Theory**

Offers a general introduction to the electrical concepts used in Ohm's law as applied to DC series circuits. Includes atomic theory, electromotive force, resistance, and electric power equations. Introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchoff's voltage and current laws, and circuit analysis.

- **40204-08 Alternating Current**

Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components.

- **40205-08 E & I Test Equipment**

Focuses on proper selection, inspection, and use of common electrical and instrumentation test equipment, including voltage testers, clamp-on

ammeters, ohmmeters, multimeters, phase/motor rotation testers, data recording equipment, field communicators, pressure testers, and dead weight testers. Also covers safety precautions and meter category ratings.

- **40206-08 Flow, Pressure, Level and Temperature**

Presents devices used to measure flow, pressure, level, and temperature, along with their principles of operation.

- **40207-08 Process Mathematics**

Covers measurement of mass, weight, pressure, temperature, and flow, conversion of units, and their application to instrumentation.

- **40208-08 Hand Bending of Conduit**

Provides an introduction to conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming and threading conduit.

- **40209-08 Tubing**

Introduces a variety of tubing, tubing materials, tools, and work practices. Covers proper storage and handling, cutting, deburring, reaming, bending and flaring of tubing.

- **40210-08 Clean, Purge, and Test Tubing and Piping Systems**

Presents safe methods for cleaning, purging, blowing down, pressure testing, and leak testing tubing, piping, and hoses used in instrumentation.

- **40211-08 Instrument Drawings and Documents, Part 1**

Introduces instrument symbols, abbreviations, and specific types of drawings and documents, including instrument indexes, installation detail drawings, location drawings, and control loops

- **40212-08 Conductors and Cables**

Focuses on the types and applications of conductors and electrical cabling and covers proper wiring techniques. Stresses the applicable NEC requirements.

- **40213-08 Conductor Terminations and Splices**

Describes methods of terminating and splicing conductors of all types and sizes, including preparing and taping conductors.

LEVEL THREE

- **40301-08 Hazardous Locations**

Covers all classes of hazardous locations, including seals, components, and equipment approved for use in various hazardous locations.

- **40302-08 Electrical Components**

Introduces the principles of electronics and semiconductor theory, components, and applications.

- **40303-08 E & I Drawings**

Covers reading and interpreting of piping and instrumentation drawings, loop

sheets, flow diagrams, isometrics, and orthographics, enabling trainees to identify types of instrumentation and the specifications for installation.

- **40304-08 Motor Controls**

Provides information on selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

- **40305-08 Distribution Equipment**

Explains distribution equipment, including grounding, switchboard and ground fault maintenance, transformers, and electrical drawing identification.

- **40306-08 Transformers**

Discusses transformer types, construction, connections, protection, and grounding along with capacitors and rectifiers.

- **40307-08 Conductor Selection and Calculation**

Covers the types of conductors used in wiring systems, including insulation, current-carrying capacity, and temperature ratings.

- **40308-08 Temporary Grounding**

Covers the methods used to eliminate or reduce electrical shock hazards to personnel working on electrical equipment.

- **40309-08 Commercial and Industrial Electrical Services**

Covers methods and techniques for both single-phase and three-phase services, including metering equipment and NEC regulations.

- **40310-08 Pipe Layout and Installations**

Introduces piping and tubing layout procedures. Explains the steps in creating a hand-sketched isometric drawing that can be applied in the piping and tubing installation. Introduces methods and procedures used to measure, cut, bend, and support piping and tubing.

- **40311-08 Machine Bending of Conduit**

Covers all types of bends in all sizes of conduit up to six inches. Focuses on mechanical, hydraulic, and electrical benders.

- **40312-08 Hydraulic and Pneumatic Controls**

Explains the basic principles of hydraulic and pneumatic systems and the components used in these systems, along with related safety concerns.

- **40313-08 Motor-Operated Valves**

Covers motor-driven valves, ranging from the small, servo-mechanical actuators to the very large valves that could only be operated by several people if they were not motor driven. Includes electrical, pneumatic, and hydraulic operators.

LEVEL FOUR

- **40401-09 Standby and Emergency Systems**

Explains the installation, utilization and maintenance requirements for both standby and emergency electrical systems

- **40402-09 Basic Process, Control Elements, Transducers, and Transmitters**

Discusses sensing and transmitting devices used in an instrumentation loop, along with the process variables being measured by the detectors or sensors. Gives examples of technical manuals and specification sheets. Explains how control devices are selected and to draw basic control loop diagrams that include a measuring element, a transducer, and a transmitter

- **40403-09 Instrumentation Calibration and Configuration**

Introduces methods of instrumentation calibration, including the three- and five-point methods. Covers components that require calibration in pneumatic, analog, and smart lops, as well as methods used to calibrate these components.

- **40404-09 Control Valves, Actuators, and Positioners**

Covers the construction, operation, and uses of control valves, actuators and positioners that are driven, and in some cases controlled by, compressed air. Explains the installation and maintenance of these devices, and includes alignment and troubleshooting procedures.

- **40405-09 Performing Loop Checks**

Covers loop check, steps, including verifying mechanical installation, validating that the loop has correct tag numbers, performing loop checks, and proving the loop.

- **40406-09 Troubleshooting and Commissioning a Loop**

Teaches troubleshooting techniques used to locate problems in control loops, and how to isolate a loop in order to troubleshoot it. Covers commissioning of a loop once it is repaired, loop checked, and calibrated.

- **40407-09 Process Control Loops and Tuning**

Describes control loops, devices and terms. Introduces formulas and their applications to PID control. Offers a theory-based approach to PID control and its application in industrial process control. Addresses open, closed and visual loop tuning.

- **40408-09 Data Networks**

Introduces terms associated with data network devices and computers used in industrial facilities. Explains how data network devices and computers are interconnected for communication purposes. Describes how open connectivity is used in industrial data networks, and explores the hardware devices used in a data highway system.

- **40409-09 Programmable Logic Controllers**

Introduces the application of PLCs in industrial process control, as well as the binary numbering system used in computer-based control. Covers components of PLCs, including power supplies, I/0 modules, processor modules, types of communication, bus, and memory

- **40410-09 Distributed Control Systems**

Describes how DCS was developed by combining the technologies of single loop Control, direct digital control, and supervisory control. Covers DCS hardware requirements, how control loops are implements into a DCS, Types of data transmission used in DCS, communication protocols, and human interfaces.

Who to Contact in Mississippi

For more information on becoming an Industrial Maintenance – Electrical Technician contact MCEF at 601-605-2989.