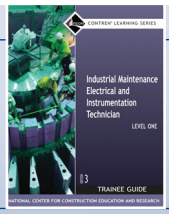
L1 INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN



LEVEL 1

Curriculum Notes

- 197.5 Hours (includes Core)
- Revised: 2007, Third Edition
- Downloadable instructor resources are available.

PAPERBACK	ISBN
Trainee Guide: $74.99	978-0-13-228606-0

MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Orientation to the Trade *(2.5 Hours)*
ISBN 978-0-13-614612-4
(Module ID 40101-07) Covers the history of the trade, and provides an overview of the industrial maintenance craft. Describes apprenticeship and training programs, as well as career opportunities. Also describes the responsibilities and characteristics of successful workers.

Tools of the Trade *(5 Hours)*
ISBN 978-0-13-614613-1
(Module ID 40102-07) Introduces the hand and power tools used in industrial maintenance. Covers safety procedures and proper use of these tools.

Fasteners and Anchors *(5 Hours)*
ISBN 978-0-13-614614-8
(Module ID 40103-07) Covers hardware and systems used in industrial maintenance. Describes anchors and supports, their applications, and how to install them safely.

Oxyfuel Cutting *(17.5 Hours)*
ISBN 978-0-13-614615-5
(Module ID 40104-07) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Explains how to perform straight line cutting, piercing, beveling, washing, and gouging.

Gaskets and Packing *(10 Hours)*
ISBN 978-0-13-614616-2
(Module ID 40105-07) Introduces gaskets and gasket material, packing and packing material, and types of O-ring material. Explains the use of gaskets, packing, and O-rings, and how to fabricate a gasket.

Craft-Related Mathematics *(15 Hours)*
ISBN 978-0-13-614617-9
(Module ID 40106-07) Explains how to use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

Construction Drawings *(12.5 Hours)*
ISBN 978-0-13-614618-6
(Module ID 40107-07) Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, basic circuit diagrams, and detail sheets.

Pumps and Drivers *(5 Hours)*
ISBN 978-0-13-614619-3
(Module ID 40108-07) Explains centrifugal, rotary, reciprocating, metering, and vacuum pump operation and installation methods, as well as types of drivers. Describes net positive suction head and cavitation.

Valves *(5 Hours)*
ISBN 978-0-13-614620-9
(Module ID 40109-07) Identifies different types of valves and describes their installation, storage, and handling.

Introduction to Test Instruments *(7.5 Hours)*
ISBN 978-0-13-614621-6
(Module ID 40110-07) Introduces test equipment for industrial maintenance, including tachometers, pyrometers, strobe meters, voltage testers, and automated diagnostic tools.

Material Handling and Hand Rigging *(15 Hours)*
ISBN 978-0-13-614622-3
(Module ID 40111-07) Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

Mobile and Support Equipment *(10 Hours)*
ISBN 978-0-13-614623-0
(Module ID 40112-07) Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, manlifts, compressors, and generators.

Lubrication *(12.5 Hours)*
ISBN 978-0-13-614624-7
(Module ID 40113-07) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

L2 INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN

LEVEL 2

Curriculum Notes

- 160 Hours
- Revised: 2008, Third Edition
- Downloadable instructor resources are available.

PAPERBACK	ISBN
Trainee Guide: $99.99	978-0-13-614390-1

MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Industrial Safety for E&I Technicians *(12.5 Hours)*
ISBN 978-0-13-604701-8
(Module ID 40201-08) Covers safety rules and regulations for electrical workers, precautions for electrical hazards on the job, and the OSHA-mandated lockout/tagout procedure.

Introduction to the *National Electrical Code*® *(5 Hours)*
ISBN 978-0-13-604702-5
(Module ID 40202-08) Provides a road map for using the *NEC*®. Introduces the layout and types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

Electrical Theory *(15 Hours)*
ISBN 978-0-13-604704-9
(Module ID 40203-08) Introduces 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, Kirchhoff's voltage and current laws, and circuit analysis.

Alternating Current *(20 Hours)*
ISBN 978-0-13-604705-6
(Module ID 40204-08) 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.

E&I Test Equipment *(10 Hours)*
ISBN 978-0-13-604706-3
(Module ID 40205-08) 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.

Flow, Pressure, Level, and Temperature *(15 Hours)*
ISBN 978-0-13-604707-0
(Module ID 40206-08) Presents devices used to measure flow, pressure, level, and temperature, along with their principles of operation.

Continued on following page

Process Mathematics *(15 Hours)*
ISBN 978-0-13-604708-7
(Module ID 40207-08) Covers measurement of mass, weight, pressure, temperature, and flow, conversion of units, and their application to industrial maintenance.

Hand Bending *(10 Hours)*
ISBN 978-0-13-604709-4
(Module ID 40208-08) Introduces conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming, and threading conduit.

Tubing *(15 Hours)*
ISBN 978-0-13-604710-0
(Module ID 40209-08) Introduces a variety of tubing, tubing materials, tools, and work practices. Covers proper storage and handling, cutting, deburring, reaming, bending, and flaring of tubing.

Clean, Purge, and Test Tubing and Piping Systems *(7.5 Hours)*
ISBN 978-0-13-604711-7
(Module ID 40210-08) Presents safe methods for cleaning, purging, blowing down, pressure testing, and leak testing tubing, piping, and hoses used in industrial maintenance.

Instrument Drawings and Documents, Part One *(15 Hours)*
ISBN 978-0-13-604713-1
(Module ID 40211-08) Introduces instrument symbols, abbreviations, and drawings and documents, including instrument indexes, installation detail drawings, location drawings, and control loops.

Conductors and Cables *(10 Hours)*
ISBN 978-0-13-604714-8
(Module ID 40212-08) Focuses on the types and applications of conductors and electrical cabling and covers proper wiring techniques. Stresses the applicable *NEC*® requirements.

Conductor Terminations and Splices *(10 Hours)*
ISBN 978-0-13-604715-5
(Module ID 40213-08) Describes methods of terminating and splicing conductors of all types and sizes, including preparing and taping conductors.

L3 INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN

LEVEL 3

Curriculum Notes

- 182.5 Hours
- Revised: 2009, Third Edition
- Downloadable instructor resources are available.

PAPERBACK	ISBN
Trainee Guide: $99.99	978-0-13-604499-4

MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Hazardous Locations *(10 Hours)*
ISBN 978-0-13-604694-3
(Module ID 40301-09) Covers all classes of hazardous locations, including seals, components, and equipment approved for use in various hazardous locations.

Electronic Components *(10 Hours)*
ISBN 978-0-13-604696-7
(Module ID 40302-09) Introduces the principles of electronics and semiconductor theory, components, and applications.

E & I Drawings *(10 Hours)*
ISBN 978-0-13-604697-4
(Module ID 40303-09) Explains how to read and interpret piping and instrumentation drawings, loop sheets, flow diagrams, isometrics, and orthographics, in order to identify types of instrumentation and the specifications for installation.

Motor Controls *(15 Hours)*
ISBN 978-0-13-604698-1
(Module ID 40304-09) Describes selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

Distribution Equipment *(17.5 Hours)*
ISBN 978-0-13-604734-6
(Module ID 40305-09) Explains distribution equipment, including grounding, switchboard and ground fault maintenance, transformers, and electrical drawing identification.

Transformer Applications *(7.5 Hours)*
ISBN 978-0-13-604735-3
(Module ID 40306-09) Discusses transformer types, construction, connections, protection, and grounding along with capacitors and rectifiers.

Conductor Selection and Calculation *(15 Hours)*
ISBN 978-0-13-604736-0
(Module ID 40307-09) Covers the types of conductors used in wiring systems, including insulation, current-carrying capacity, and temperature ratings.

Temporary Grounding *(15 Hours)*
ISBN 978-0-13-604738-4
(Module ID 40308-09) Covers the methods used to eliminate or reduce electrical shock hazards to personnel working on electrical equipment.

Layout and Installation of Tubing and Piping Systems *(22.5 Hours)*
ISBN 978-0-13-604740-7
(Module ID 40309-09) Introduces piping and tubing layout procedures. Explains the steps for creating a hand-sketched isometric drawing that can be applied to a piping and tubing installation. Introduces methods and procedures used to measure, cut, bend, and support piping and tubing.

Machine Bending of Conduit *(15 Hours)*
ISBN 978-0-13-604741-4
(Module ID 40310-09) Covers bends in conduit up to six inches. Focuses on mechanical, hydraulic, and electrical benders.

Hydraulic Controls *(15 Hours)*
ISBN 978-0-13-604742-1
(Module ID 40311-09) Introduces hydraulic principles and fluids, functions and controls of system devices, hydraulic symbols, and drawings. Covers safety considerations for hydraulic systems, as well as troubleshooting.

Pneumatic Controls *(15 Hours)*
ISBN 978-0-13-604739-1
(Module ID 40312-09) Describes principles of atmospheric and compressed air gases, and how compressors transmit and treat compressed (pneumatic) air. Covers pneumatic system symbols, drawings, and system safety. Addresses the functions and control of pneumatic system components and provides guidelines for troubleshooting.

Motor-Operated Valves *(15 Hours)*
ISBN 978-0-13-604743-8
(Module ID 40313-09) Covers motor-driven valves, ranging from small, servo-mechanical actuators to large valves that could only be operated by several people if they were not motor driven. Includes electrical, pneumatic, and hydraulic operators.

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L4 INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN

LEVEL 4

Curriculum Notes

- 165 Hours
- Revised: 2009, Third Edition
- Downloadable instructor resources are available.

PAPERBACK	ISBN
Trainee Guide: $99.99	978-0-13-609955-0

MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Standby and Emergency Systems *(12.5 Hours)*
ISBN 978-0-13-609163-9
(Module ID 40401-09) Explains the installation, utilization, and maintenance requirements for standby and emergency electrical systems.

Basic Process Control Elements, Transducers, and Transmitters *(15 Hours)*
ISBN 978-0-13-609165-3
(Module ID 40402-09) Discusses sensing and transmitting devices used in an instrumentation loop, along with the process variables measured by the detectors or sensors. Gives examples of technical manuals and specification sheets. Explains how control devices are selected, and how to draw basic control loop diagrams that include a measuring element, a transducer, and a transmitter.

Instrumentation Calibration and Configuration *(10 Hours)*
ISBN 978-0-13-609166-0
(Module ID 40403-09) Introduces methods of instrumentation calibration, including the three- and five-point methods. Covers components that require calibration in pneumatic, analog, and smart loops, as well as methods used to calibrate these components.

Pneumatic Control Valves, Actuators, and Positioners *(40 Hours)*
ISBN 978-0-13-609167-7
(Module ID 40404-09) 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.

Performing Loop Checks *(7.5 Hours)*
ISBN 978-0-13-609168-4
(Module ID 40405-09) Covers loop check steps, including verifying mechanical installation, validating that the loop has correct tag numbers, performing loop checks, and proving the loop.

Troubleshooting and Commissioning a Loop *(10 Hours)*
ISBN 978-0-13-609169-1
(Module ID 40406-09) 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.

Process Control Loops and Tuning *(20 Hours)*
ISBN 978-0-13-609135-6
(Module ID 40407-09) 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.

Data Networks *(15 Hours)*
ISBN 978-0-13-609138-7
(Module ID 40408-09) 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.

Programmable Logic Controllers *(17.5 Hours)*
ISBN 978-0-13-609136-3
(Module ID 40409-09) 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/O modules, processor modules, types of communication bus, and memory.

Distributed Control Systems *(17.5 Hours)*
ISBN 978-0-13-609137-0
(Module ID 40410-09) 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 implemented into a DCS, types of data transmission used in DCS, communication protocols, and human interfaces.