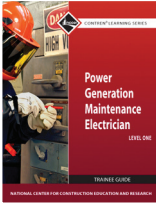




Power Generation Maintenance Electrician

L1 POWER GENERATION MAINTENANCE ELECTRICIAN

LEVEL 1



Curriculum Notes

- 232.5 Hours
- Includes 97.5 hours of *Power Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
 - Hardcover: \$79.99, ISBN 978-0-13-466829-1
- Published: 2010
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at www.nccer.org/irc.

PAPERBACK

Trainee Guide: \$69.99

ISBN

978-0-13-215421-5

MODULES

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

Tools of the Trade (5 Hours)

ISBN 978-0-13-614613-1

(Module ID 40102-07; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) 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; from *Industrial Maintenance E&I Technician Level One*) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

SMAW Equipment and Setup (5 Hours)

ISBN 978-0-13-610533-6

(Module ID 29107-09; from *Welding Level One, Fourth Edition*) Describes SMAW welding and welding safety. Explains how to connect welding current and set up arc welding equipment. Also explains how to use tools for cleaning welds.

L2 POWER GENERATION MAINTENANCE ELECTRICIAN

LEVEL 2

Curriculum Notes

- 167.5 Hours
- Published: 2010
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at www.nccer.org/irc.

PAPERBACK

Trainee Guide: \$99.99

ISBN

978-0-13-215423-9

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; from *Industrial Maintenance E&I Technician Level Two*) Covers safety rules and regulations for electrical workers, precautions for electrical hazards on the job, and the OSHA-mandated lockout/tagout procedure.

Managing Electrical Hazards (12.5 Hours)

ISBN 978-0-13-608661-1

(Module ID 26501-09; from *Electrical, First Edition*) Introduces electrical hazards in the workplace and describes how to avoid them. Explains how to analyze and document shock and arc flash hazards, and how to plan and conduct work around them. Includes examples of how to complete an energized electrical work permit, and how to select the specialized personal protective equipment required for electrical work.

Introduction to the National Electrical Code®

(5 Hours)

ISBN 978-0-13-604702-5

(Module ID 40202-08; from *Industrial Maintenance E&I Technician Level Two*) 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; from *Industrial Maintenance E&I Technician Level Two*) 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.

Continued on following page



Power Generation Maintenance Electrician Level 2 (continued)

Alternating Current (20 Hours)

ISBN 978-0-13-604705-6

(Module ID 40204-08; from *Industrial Maintenance E&I Technician Level Two*) 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 Drawings (10 Hours)

ISBN 978-0-13-604697-4

(Module ID 40303-09; from *Industrial Maintenance E&I Technician Level Three*) 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.

E&I Test Equipment (10 Hours)

ISBN 978-0-13-604706-3

(Module ID 40205-08; from *Industrial Maintenance E&I Technician Level Two*) 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.

Conductors and Cables (10 Hours)

ISBN 978-0-13-604714-8

(Module ID 40212-08; from *Industrial Maintenance E&I Technician Level Two*) 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; from *Industrial Maintenance E&I Technician Level Two*) Describes methods of terminating and splicing conductors of all types and sizes, including preparing and taping conductors.

Motor Controls (15 Hours)

ISBN 978-0-13-604698-1

(Module ID 40304-09; from *Industrial Maintenance E&I Technician Level Three*) Describes selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

Hydraulic Controls (15 Hours)

ISBN 978-0-13-604742-1

(Module ID 40311-09; from *Industrial Maintenance E&I Technician Level Three*) 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; from *Industrial Maintenance E&I Technician Level Three*) 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.

Programmable Logic Controllers (17.5 Hours)

ISBN 978-0-13-609136-3

(Module ID 40409-09; from *Industrial Maintenance E&I Technician Level Four*) 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.

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**POWER GENERATION
MAINTENANCE ELECTRICIAN**

LEVEL 3

Curriculum Notes

- 222.5 Hours
- Published: 2010
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at www.nccer.org/irc.

PAPERBACK

Trainee Guide: \$99.99

ISBN

978-0-13-215425-3

MODULES

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

Conductor Installations (10 Hours)

ISBN 978-0-13-266135-5

(Module ID 26206-08; from *Electrical Level Two, Sixth Edition*) Covers the transportation, storage, and setup of cable reels; methods of rigging; and procedures for complete cable pulls in raceways and cable trays.

Cable Tray (7.5 Hours)

ISBN 978-0-13-266136-2

(Module ID 26207-08; from *Electrical Level Two, Sixth Edition*) Focuses on NEC® installation requirements for cable tray, including cable installations.

Grounding and Bonding (15 Hours)

ISBN 978-0-13-266138-6

(Module ID 26209-08; from *Electrical Level Two, Sixth Edition*) Focuses on the purpose of grounding and bonding electrical systems. Thoroughly covers NEC® requirements.

Hand Bending (10 Hours)

ISBN 978-0-13-604709-4

(Module ID 40208-08; from *Industrial Maintenance E&I Technician Level Two*) Introduces conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming, and threading conduit.

Machine Bending of Conduit (15 Hours)

ISBN 978-0-13-604741-4

(Module ID 40310-09; from *Industrial Maintenance E&I Technician Level Three*) Covers bends in conduit up to six inches. Focuses on mechanical, hydraulic, and electrical benders.

Electric Lighting (15 Hours)

ISBN 978-0-13-266132-4

(Module ID 26203-08; from *Electrical Level Two, Sixth Edition*) Introduces principles of human vision and the characteristics of light. Focuses on the handling and installation of various types of lamps and lighting fixtures.

Practical Applications of Lighting (12.5 Hours)

ISBN 978-0-13-293676-7

(Module ID 26303-08; from *Electrical Level Three, Sixth Edition*) Describes specific types of incandescent, fluorescent, and HID lamps, as well as ballasts. Also covers troubleshooting and various types of lighting controls.

Hazardous Locations (10 Hours)

ISBN 978-0-13-604694-3

(Module ID 40301-09; from *Industrial Maintenance E&I Technician Level Three*) Covers all classes of hazardous locations, including seals, components, and equipment approved for use in various hazardous locations.

Circuit Breakers and Fuses (12.5 Hours)

ISBN 978-0-13-266139-3

(Module ID 26210-08; from *Electrical Level Two, Sixth Edition*) Describes fuses and circuit breakers along with their practical applications. Also covers sizing.

Transformer Applications (7.5 Hours)

ISBN 978-0-13-604735-3

(Module ID 40306-09; from *Industrial Maintenance E&I Technician Level Three*) Discusses transformer types, construction, connections, protection, and grounding along with capacitors and rectifiers.

Distribution Equipment (17.5 Hours)

ISBN 978-0-13-604734-6

(Module ID 40305-09; from *Industrial Maintenance E&I Technician Level Three*) Explains distribution equipment, including grounding, switchboard and ground fault maintenance, transformers, and electrical drawing identification.

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Power Generation Maintenance Electrician Level 3 (continued)

Power Plant Electrical Systems (12.5 Hours)

ISBN 978-0-13-272106-6

(Module ID 50301-11) Describes how the electrical power to operate a power station is developed and distributed in normal, shutdown, and emergency situations. Covers equipment used in power stations, including circuit breakers, switchgear, and motor control centers.

Conductor Selection and Calculations (15 Hours)

ISBN 978-0-13-604736-0

(Module ID 40307-09; from *Industrial Maintenance E&I Technician Level Three*) Covers the types of conductors used in wiring systems, including insulation, current-carrying capacity, and temperature ratings.

Motors: Theory and Application (20 Hours)

ISBN 978-0-13-266131-7

(Module ID 26202-08; from *Electrical Level Two, Sixth Edition*) Covers AC and DC motors, including the main components, circuits, and connections.

Motor-Operated Valves (15 Hours)

ISBN 978-0-13-604743-8

(Module ID 40313-09; from *Industrial Maintenance E&I Technician Level Three*) 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.

Control Systems and Fundamental Concepts (12.5 Hours)

ISBN 978-0-13-266140-9

(Module ID 26211-08; from *Electrical Level Two, Sixth Edition*) Gives basic descriptions of various types of contactors and relays along with their practical applications.

Temporary Grounding (15 Hours)

ISBN 978-0-13-604738-4

(Module ID 40308-09; from *Industrial Maintenance E&I Technician Level Three*) Covers the methods used to eliminate or reduce electrical shock hazards to personnel working on electrical equipment.

L4

POWER GENERATION MAINTENANCE ELECTRICIAN

LEVEL 4

Curriculum Notes

- 197.5 Hours
- Published: 2011
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at www.nccer.org/irc.

PAPERBACK

Trainee Guide: \$99.99

ISBN

978-0-13-215428-4

MODULES

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

Load Calculations – Branch and Feeder Circuits

(17.5 Hours)

ISBN 978-0-13-609290-2

(Module ID 26301-08; from *Electrical Level Three, Sixth Edition*) Explains how to calculate branch circuit and feeder loads for residential and commercial applications.

Motor Calculations (12.5 Hours)

ISBN 978-0-13-609299-5

(Module ID 26309-08; from *Electrical Level Three, Sixth Edition*) Covers calculations required to size conductors and overcurrent protection for motor applications.

Overcurrent Protection (25 Hours)

ISBN 978-0-13-609294-0

(Module ID 26305-08; from *Electrical Level Three, Sixth Edition*) Explains how to size and select circuit breakers and fuses for various applications. Also covers short circuit calculations and troubleshooting.

Specialty Transformers (10 Hours)

ISBN 978-0-13-609319-0

(Module ID 26406-08; from *Electrical Level Four, Sixth Edition*) Covers various types of transformers and their applications. Also provides information on selecting, sizing, and installing these devices.

Advanced Controls (20 Hours)

ISBN 978-0-13-609320-6

(Module ID 26407-08; from *Electrical Level Four, Sixth Edition*) Discusses applications and operating principles of solid-state controls, reduced-voltage starters, and adjustable frequency drives. Also covers basic troubleshooting procedures.

Motor Operation and Maintenance (10 Hours)

ISBN 978-0-13-609324-4

(Module ID 26410-08; from *Electrical Level Four, Sixth Edition*) Covers motor cleaning, testing, and preventive maintenance. Also describes basic troubleshooting procedures.

Generator Maintenance (20 Hours)

ISBN 978-0-13-266211-6

(Module ID 50401-10) Covers the operating characteristics and major components of AC and DC generators. Topics include generator connection methods; voltage regulators; auxiliary systems; and maintenance procedures.

Switchgear and Breaker Maintenance (25 Hours)

ISBN 978-0-13-266212-3

(Module ID 50402-11) Reviews the safety practices associated with power station electrical work. Explains how medium-voltage and low-voltage sources are developed and used in the power station, and how the station power system functions in a blackout or shutdown situation. Also describes the circuit breakers, switchgear, and motor control centers used in power stations, and provides instructions for maintenance of these devices.

Preventive and Predictive Maintenance

(10 Hours)

ISBN 978-0-13-610445-2

(Module ID 32401-09; from *Industrial Maintenance Mechanic Level Four*) Explains preventive and predictive maintenance and non-destructive testing, and introduces the basic techniques for testing. Also describes lubricant analysis, and acoustic, infrared, and vibration testing.

Medium Voltage Terminations/Splices

(10 Hours)

ISBN 978-0-13-609325-1

(Module ID 26411-08; from *Electrical Level Four, Sixth Edition*) Offers an overview of the NEC® and cable manufacturers' requirements for medium-voltage terminations and splices.

Fire Alarm Systems (15 Hours)

ISBN 978-0-13-609283-4

(Module ID 26405-08; from *Electrical Level Four, Sixth Edition*) Covers fire alarm control units, Digital Alarm Communicator Systems (DACS), wiring for alarm initiating and notification devices, and alarm system maintenance.

Heat Tracing and Freeze Protection (10 Hours)

ISBN 978-0-13-609323-7

(Module ID 26409-08; from *Electrical Level Four, Sixth Edition*) Covers heat tracing systems along with their applications and installation requirements.

Standby and Emergency Systems (12.5 Hours)

ISBN 978-0-13-609163-9

(Module ID 40401-09; from *Industrial Maintenance E&I Technician Level Four*) Explains the installation, utilization, and maintenance requirements for standby and emergency electrical systems.