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**POWER GENERATION MAINTENANCE MECHANIC**

**LEVEL 1**

*Curriculum Notes*

- **225 Hours**
- **Includes 100 hours of Power Industry Fundamentals, which is a prerequisite for Level One completion and must be purchased separately.**
- **Published: 2010**
- **Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at www.nccer.org/irc.**

**PAPERBACK**

*Trainee Guide: $67  
Individual Modules: $20  
see module list*

**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 978-0-13-614584-4  
(Module ID 32102-07; from Industrial Maintenance Mechanic Level One) Introduces hand and power tools used in industrial maintenance. Covers safety procedures and proper use of these tools.*

**Fasteners and Anchors** (5 Hours)

(Module ID 32103-07; from Industrial Maintenance Mechanic Level One) Covers the hardware and systems used in industrial maintenance. Describes anchors and supports, their applications, and how to install them safely.*

**Gaskets and Packing** (10 Hours)

(Module ID 32105-07; from Industrial Maintenance Mechanic 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)

(Module ID 32106-07; from Industrial Maintenance Mechanic 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)

(Module ID 32107-07; from Industrial Maintenance Mechanic Level One) Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&ID’s, isometric drawings, basic circuit diagrams, and detail sheets.*

**Pumps and Drivers** (5 Hours)

(Module ID 32108-07; from Industrial Maintenance Mechanic 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)

(Module ID 32109-07; from Industrial Maintenance Mechanic Level One) Identifies different types of valves and describes their installation as well as valve storage and handling.*

**Introduction to Test Instruments** (7.5 Hours)

(Module ID 32110-07; from Industrial Maintenance Mechanic 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)

(Module ID 32111-07; from Industrial Maintenance Mechanic 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 978-0-13-614595-0  
(Module ID 32112-07; from Industrial Maintenance Mechanic Level One) Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.*

**LUBRICATION** (12.5 Hours)

(Module ID 32113-07; from Industrial Maintenance Mechanic Level One) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts. Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.*

**SMAW Equipment and Setup** (5 Hours)

*ISBN 978-0-13-614597-4  
(Module ID 32114-07; 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.*

**Advanced Layout** (20 Hours)

(Module ID 32201-07; from Industrial Maintenance Mechanic Level Two) Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.*

**Advanced Trade Math** (30 Hours)

(Module ID 32301-08; from Industrial Maintenance Mechanic Level Three) Explains right triangle trigonometry and its use in the trade. Also covers interpolation, equilateral and isosceles triangles and the laws of acute triangles.*

**Precision Measuring Tools** (20 Hours)

(Module ID 32302-08; from Industrial Maintenance Mechanic Level Three) Explains how to select, inspect, use and care for levels, feeler gauges, calipers, micrometers, height gauges and surface plates, dial indicators, protractors, parallels and gauge blocks, trammels, and pyrometers.*

**Introduction to Bearings** (15 Hours)

(Module ID 32207-07; from Industrial Maintenance Mechanic Level Two) Introduces plain, ball, roller, thrust, guide, flanged, pillow block, and takeup bearings. Discusses bearing materials and designations.*

**Installing Bearings** (20 Hours)

(Module ID 32303-08; from Industrial Maintenance Mechanic Level Three) Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.*

**Installing Couplings** (15 Hours)

(Module ID 32304-08; from Industrial Maintenance Mechanic Level Three) Identifies various types of couplings, and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.*

Continued on following page
Installing Mechanical Seals (20 Hours)
(Module ID 32308-08; from Industrial Maintenance Mechanic Level Three) Covers the function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting and installing mechanical seals.

Conventional Alignment (30 Hours)
(Module ID 32306-08; from Industrial Maintenance Mechanic Level Three) Covers types of misalignment, aligning couplings using a straightedge and feeler gauge, adjusting parallel and angular alignment, using a dial indicator, and eliminating coupling stress.

Reverse Alignment (30 Hours)
(Module ID 32404-09; from Industrial Maintenance Mechanic Level Four) Describes preparation for dial indicator reverse alignment, and explains the procedures for setting up reverse alignment jigs. Explains graphic and mathematical techniques for aligning equipment based on reverse dial indicator measurements.

Laser Alignment (25 Hours)
ISBN 978-0-13-610449-0
(Module ID 32405-09; from Industrial Maintenance Mechanic Level Four) Using one example system, describes the principles of using laser alignment systems to perform alignments.

Installing Belt and Chain Drives (10 Hours)
(Module ID 32307-08; from Industrial Maintenance Mechanic Level Three) Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

Introduction to Piping Components (5 Hours)
(Module ID 32202-07; from Industrial Maintenance Mechanic Level Two) Introduces chemical, compressed air, fuel oil, steam, and water systems. Explains how to identify piping systems according to color codes.

Heaters, Furnaces, Heat Exchangers, Cooling Towers and Fin Fans (30 Hours)
(Module ID 32211-07; from Industrial Maintenance Mechanic Level Two) Introduces equipment used to transfer and remove heat from systems in process.

Hydrostatic and Pneumatic Testing (10 Hours)
(Module ID 32204-07; from Industrial Maintenance Mechanic Level Two) Describes preparation for dial indicator reverse alignment, and explains the procedures for setting up reverse alignment jigs. Explains graphic and mathematical techniques for aligning equipment based on reverse dial indicator measurements.

Installing Fans and Blowers (10 Hours)
(Module ID 15312-08; from Millwright Level Three) Explains how to install axial-flow fans, centrifugal fans, and roots-type and screw-type blowers.

Conveyors (5 Hours)
(Module ID 15401-08; from Millwright Level Four) Describes conveyor systems and their principles of operation.

Troubleshooting and Repairing Conveyors (12.5 Hours)
(Module ID 15402-08; from Millwright Level Four) Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors.

Copper and Plastic Piping Practices (5 Hours)
(Module ID 32203-07; from Industrial Maintenance Mechanic Level Two) Covers the selection, preparation, joining, and support of copper and plastic piping and fittings.

Introduction to Ferrous Metal Piping Practices (5 Hours)
ISBN 978-0-13-604624-0
(Module ID 32204-07; from Industrial Maintenance Mechanic Level Two) Covers iron and steel pipe and fittings and provides step-by-step instructions for cutting, threading, and joining ferrous piping.

Identify, Install and Maintain Valves (10 Hours)
(Module ID 32205-07; from Industrial Maintenance Mechanic Level Two) Explains how to remove and install threaded and flanged valves, how to replace valve stem O-ring and bonnet gasket, and how to repack a valve stuffing box. Also discusses the purpose of valve packing.

Basic Hydraulic Systems (10 Hours)
(Module ID 15409-08; from Millwright Level Four) Describes principles and types of hydraulic equipment and related safety procedures. Describes applications of hydraulic equipment.

Troubleshooting and Repairing Hydraulic Equipment (7.5 Hours)
(Module ID 15410-08; from Millwright Level Four) Explains inspecting hydraulic systems, diagnosing problems, and repairing these systems. Shows how to read hydraulic schematic symbols.

Motor-Operated Valves (15 Hours)
(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.

Advanced Blueprint Reading (25 Hours)
(Module ID 32402-09; from Industrial Maintenance Mechanic Level Four) Describes the use of drawing sets to obtain system information. Explains the process of identifying a part of a machine for repair or replacement from a set of drawings.

Continued on following page
## Power Generation Maintenance Mechanic Level 4

### Curriculum Notes
- 187.5 Hours
- Published: 2010
- Downloadable instructor resources that include module tests, PowerPoint®, and performance profile sheets are available at www.nccer.org/irc.

### PAPERBACK
- Trainee Guide: $97
- Individual Modules: $20

### Modules

#### Fuel Preparation and Delivery Equipment
- **(25 Hours)**
- (Module ID 52402-10) Explains the basic operations of a coal-fired boiler system. Describes the delivery processes from the storage yard into the coal preparation equipment, and from the equipment into the furnace. Addresses the maintenance checks that need to be made on coal delivery and preparation equipment and explains how solid fuel wastes are disposed of in coal-burning furnace systems. Describes how other solid-fuel furnaces, such as biomass furnaces, are used with boilers.

#### Vibration and Balancing
- **(12.5 Hours)**
- (Module ID 52401-10) Reviews machine basics and explains the causes of machine vibrations. Reviews the basics of vibration analysis and covers the devices used to detect and analyze vibration signatures. Explains how and why vibration analysis is used as part of predictive maintenance programs. Describes field machine balancing.

#### Preventive and Predictive Maintenance
- **(10 Hours)**
- (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.

#### Compressors and Pneumatic Systems
- **(35 Hours)**
- (Module ID 32403-09; from Industrial Maintenance Mechanic Level Four) Describes the theory and practice of compressing and transporting gases. Explains the types and principles of compressors and compressed air treatment equipment, as well as compressed air use and safety.

#### Troubleshooting and Repairing Pumps
- **(10 Hours)**
- (Module ID 32407-09; from Industrial Maintenance Mechanic Level Four) Explains how to inspect, troubleshoot, disassemble, assemble, and install a pump. Also describes the process of preparing for startup.

#### Troubleshooting and Repairing Gearboxes
- **(20 Hours)**
- (Module ID 32408-09; from Industrial Maintenance Mechanic Level Four) Describes types and operation of gearboxes, and gearbox diagnostics. Explains how to troubleshoot, remove, and disassemble gearboxes, how to identify gear wear patterns, and how to install and maintain gearboxes.

#### Setting Baseplates and Prealignment
- **(30 Hours)**
- (Module ID 32305-08; from Industrial Maintenance Mechanic Level Three) Explains how to lay out and install baseplates and soleplates. Describes how to field-verify a plate installation. Covers precision leveling procedures and performing clearance installation. Also describes basic steps for setting motors and pumps.

#### Turbines
- **(20 Hours)**
- (Module ID 15505-09; from Millwright Level Five) Describes types of turbines and their components. Describes the operation and common applications of particular types, including gas, steam, and water turbines.

#### Maintaining and Repairing Turbine Components
- **(15 Hours)**
- (Module ID 15506-09; from Millwright Level Five) Describes the process of inspecting and repairing key components of turbines. Explains the guidelines for maintaining large steam turbines.