

## L1 INDUSTRIAL MAINTENANCE MECHANIC



LEVEL 1

### Curriculum Notes

- 195 Hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 14 for ordering information.)
- Revised: 2007, Third Edition
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

PAPERBACK	ISBN
Trainee Guide: \$67	978-0-13-228608-4
Instructor's Guide: \$67	978-0-13-228609-1

### MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor's Guide. The following ISBN and pricing information is for ordering individual modules only.

#### Orientation to the Trade (2.5 Hours)

Trainee \$20 ISBN 978-0-13-614583-7  
 Instructor \$20 ISBN 978-0-13-614563-9  
 (Module ID 32101-07) 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 in industrial maintenance. Describes the responsibilities and characteristics of successful workers.

#### Tools of the Trade (5 Hours)

Trainee \$20 ISBN 978-0-13-614584-4  
 Instructor \$20 ISBN 978-0-13-614564-6  
 (Module ID 32102-07) Introduces hand and power tools used in industrial maintenance. Covers safety procedures and proper use of these tools.

#### Fasteners and Anchors (5 Hours)

Trainee \$20 ISBN 978-0-13-614585-1  
 Instructor \$20 ISBN 978-0-13-614565-3  
 (Module ID 32103-07) Covers the hardware and systems used in industrial maintenance. Describes anchors and supports, their applications, and how to install them safely.

#### Oxyfuel Cutting (17.5 Hours)

Trainee \$20 ISBN 978-0-13-614586-8  
 Instructor \$20 ISBN 978-0-13-614566-0  
 (Module ID 32104-07) 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)

Trainee \$20 ISBN 978-0-13-614588-2  
 Instructor \$20 ISBN 978-0-13-614567-7  
 (Module ID 32105-07) 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)

Trainee \$20 ISBN 978-0-13-614589-9  
 Instructor \$20 ISBN 978-0-13-614568-4  
 (Module ID 32106-07) 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)

Trainee \$20 ISBN 978-0-13-614590-5  
 Instructor \$20 ISBN 978-0-13-614604-9  
 (Module ID 32107-07) 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)

Trainee \$20 ISBN 978-0-13-614591-2  
 Instructor \$20 ISBN 978-0-13-614605-6  
 (Module ID 32108-07) 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)

Trainee \$20 ISBN 978-0-13-614592-9  
 Instructor \$20 ISBN 978-0-13-614606-3  
 (Module ID 32109-07) Identifies different types of valves and describes their installation as well as valve storage and handling.

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

Trainee \$20 ISBN 978-0-13-614593-6  
 Instructor \$20 ISBN 978-0-13-614607-0  
 (Module ID 32110-07) Introduces test equipment for industrial maintenance, including tachometers, pyrometers, strobe meters, voltage testers, and automated diagnostic tools.

#### Material Handling and Hand Rigging (15 Hours)

Trainee \$20 ISBN 978-0-13-614594-3  
 Instructor \$20 ISBN 978-0-13-614608-7  
 (Module ID 32111-07) Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

#### Mobile and Support Equipment (10 Hours)

Trainee \$20 ISBN 978-0-13-614560-8  
 Instructor \$20 ISBN 978-0-13-614609-4  
 (Module ID 32112-07) Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, personnel lifts, compressors, and generators.

#### Lubrication (12.5 Hours)

Trainee \$20 ISBN 978-0-13-614562-2  
 Instructor \$20 ISBN 978-0-13-614611-7  
 (Module ID 32113-07) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

## L2 INDUSTRIAL MAINTENANCE MECHANIC

LEVEL 2

### Curriculum Notes

- 160 Hours
- Revised: 2007, Third Edition
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

PAPERBACK	ISBN
Trainee Guide: \$97	978-0-13-614392-5
Instructor's Guide: \$97	978-0-13-614393-2

### MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor's Guide. The following ISBN and pricing information is for ordering individual modules only.

#### Basic Layout (20 Hours)

Trainee \$20 ISBN 978-0-13-604621-9  
 Instructor \$20 ISBN 978-0-13-604668-4  
 (Module ID 32201-07) Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

#### Introduction to Pipng Components (5 Hours)

Trainee \$20 ISBN 978-0-13-604622-6  
 Instructor \$20 ISBN 978-0-13-604669-1  
 (Module ID 32202-07) Introduces chemical, compressed air, fuel oil, steam, and water systems. Explains how to identify piping systems according to color codes.

#### Copper and Plastic Piping Practices (5 Hours)

Trainee \$20 ISBN 978-0-13-604623-3  
 Instructor \$20 ISBN 978-0-13-604670-7  
 (Module ID 32203-07) Covers the selection, preparation, joining, and support of copper and plastic piping and fittings.

#### Introduction to Ferrous Metal Piping Practices (5 Hours)

Trainee \$20 ISBN 978-0-13-604624-0  
 Instructor \$20 ISBN 978-0-13-604671-4  
 (Module ID 32204-07) 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)

Trainee \$20 ISBN 978-0-13-604625-7  
 Instructor \$20 ISBN 978-0-13-604672-1  
 (Module ID 32205-07) Explains how to remove and install threaded and flanged valves, how to replace valve stem O-ring and bonnet gaskets, and how to repack a valve stuffing box. Also discusses the purpose of valve packing.

#### Hydrostatic and Pneumatic Testing (10 Hours)

Trainee \$20 ISBN 978-0-13-604626-4  
 Instructor \$20 ISBN 978-0-13-604673-8  
 (Module ID 32206-07) Describes non-destructive and pressure testing of systems and equipment.

#### Introduction to Bearings (15 Hours)

Trainee \$20 ISBN 978-0-13-604627-1  
 Instructor \$20 ISBN 978-0-13-604674-5  
 (Module ID 32207-07) Introduces plain, ball, roller, thrust, guide, flanged, pillow block, and takeup bearings. Discusses bearing materials and designations.

## Industrial Maintenance Mechanic Level 2 (continued)

### Low-Pressure Steam Systems (10 Hours)

Trainee \$20 ISBN 978-0-13-604628-8  
 Instructor \$20 ISBN 978-0-13-604675-2  
 (Module ID 32208-07) Introduces the components and functions of basic steam systems, including boilers, steam traps, and blowdown recovery systems.

### High-Pressure Steam Systems and Auxiliaries (20 Hours)

Trainee \$20 ISBN 978-0-13-604664-6  
 Instructor \$20 ISBN 978-0-13-604676-9  
 (Module ID 32209-07) Explains the functioning of high-pressure steam systems used in industry.

### Distillation Towers and Vessels (20 Hours)

Trainee \$20 ISBN 978-0-13-604665-3  
 Instructor \$20 ISBN 978-0-13-604677-6  
 (Module ID 32210-07) Introduces the various types and functioning of distillation towers and vessels, including recovery vessels and condensate processing.

### Heaters, Furnaces, Heat Exchangers, Cooling Towers, and Fin Fans (30 Hours)

Trainee \$20 ISBN 978-0-13-604666-0  
 Instructor \$20 ISBN 978-0-13-604679-0  
 (Module ID 32211-07) Introduces equipment used to transfer and remove heat from systems in process.

### Introduction to Tube Work (10 Hours)

Trainee \$20 ISBN 978-0-13-604667-7  
 Instructor \$20 ISBN 978-0-13-604680-6  
 (Module ID 32212-07) Covers the basics of working with heat exchanger and furnace tubing and tube sheets.

### Precision Measuring Tools (20 Hours)

Trainee \$20 ISBN 978-0-13-604682-0  
 Instructor \$20 ISBN 978-0-13-604657-8  
 (Module ID 32302-08) 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.

### Installing Bearings (20 Hours)

Trainee \$20 ISBN 978-0-13-604683-7  
 Instructor \$20 ISBN 978-0-13-604658-5  
 (Module ID 32303-08) Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

### Installing Couplings (15 Hours)

Trainee \$20 ISBN 978-0-13-604684-4  
 Instructor \$20 ISBN 978-0-13-604659-2  
 (Module ID 32304-08) Identifies various types of couplings, and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

### Setting Baseplates and Prealignment (30 Hours)

Trainee \$20 ISBN 978-0-13-604685-1  
 Instructor \$20 ISBN 978-0-13-604661-5  
 (Module ID 32305-08) 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.

### Conventional Alignment (30 Hours)

Trainee \$20 ISBN 978-0-13-604686-8  
 Instructor \$20 ISBN 978-0-13-604662-2  
 (Module ID 32306-08) 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.

### Installing Belt and Chain Drives (10 Hours)

Trainee \$20 ISBN 978-0-13-604688-2  
 Instructor \$20 ISBN 978-0-13-604663-9  
 (Module ID 32307-08) Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

### Installing Mechanical Seals (20 Hours)

Trainee \$20 ISBN 978-0-13-604689-9  
 Instructor \$20 ISBN 978-0-13-604699-8  
 (Module ID 32308-08) Covers the function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting and installing mechanical seals.

## L4 INDUSTRIAL MAINTENANCE MECHANIC

LEVEL 4

### Curriculum Notes

- 170 Hours
- Revised: 2009, Third Edition
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

### PAPERBACK

Trainee Guide: \$97  
 Instructor's Guide: \$97

### ISBN

978-0-13-609957-4  
 978-0-13-609959-8

### MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor's Guide. The following ISBN and pricing information is for ordering individual modules only.

### Preventive and Predictive Maintenance

(10 Hours)

Trainee \$20 ISBN 978-0-13-610445-2  
 Instructor \$20 ISBN 978-0-13-610456-8

(Module ID 32401-09) 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.

### Advanced Blueprint Reading (25 Hours)

Trainee \$20 ISBN 978-0-13-610446-9  
 Instructor \$20 ISBN 978-0-13-610457-5

(Module ID 32402-09) 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.

### Compressors and Pneumatic Systems (35 Hours)

Trainee \$20 ISBN 978-0-13-610447-6  
 Instructor \$20 ISBN 978-0-13-610458-2

(Module ID 32403-09) 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.

### Reverse Alignment (30 Hours)

Trainee \$20 ISBN 978-0-13-610448-3  
 Instructor \$20 ISBN 978-0-13-610459-9

(Module ID 32404-09) 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)

Trainee \$20 ISBN 978-0-13-610449-0  
 Instructor \$20 ISBN 978-0-13-610460-5

(Module ID 32405-09) Using one example system, describes the principles of using laser alignment systems to perform alignments.

## L3 INDUSTRIAL MAINTENANCE MECHANIC

LEVEL 3

### Curriculum Notes

- 175 Hours
- Revised: 2008, Third Edition
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

### PAPERBACK

Trainee Guide: \$97  
 Instructor's Guide: \$97

### ISBN

978-0-13-604496-3  
 978-0-13-604498-7

### MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor's Guide. The following ISBN and pricing information is for ordering individual modules only.

### Advanced Trade Math (30 Hours)

Trainee \$20 ISBN 978-0-13-604681-3  
 Instructor \$20 ISBN 978-0-13-604656-1

(Module ID 32301-08) Explains right triangle trigonometry and its use in the trade. Also covers interpolation, equilateral and isosceles triangles and the laws of acute triangles.



### **Introduction to Supervisory Skills** (15 Hours)

Trainee \$20 ISBN 978-0-13-610450-6  
Instructor \$20 ISBN 978-0-13-610461-2  
(Module ID 32406-09) Introduces human resource criteria, concepts, and skills for the craftsperson desiring to advance to leadership roles.

### **Troubleshooting and Repairing Pumps**

(10 Hours)  
Trainee \$20 ISBN 978-0-13-610452-0  
Instructor \$20 ISBN 978-0-13-610462-9  
(Module ID 32407-09) 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)  
Trainee \$20 ISBN 978-0-13-610453-7  
Instructor \$20 ISBN 978-0-13-610463-6  
(Module ID 32408-09) 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.

## **Advanced Topics**

### **Advanced Towers and Vessels** (15 Hours)

Trainee \$20 ISBN 978-0-13-610455-1  
Instructor \$20 ISBN 978-0-13-610430-8  
(Module ID 32501-09) Introduces the basics of reactor and refinery processes, including cat crackers, vacuum, and distillation. Also teaches the use of hydraulic torquing and tensioning equipment.

### **Troubleshooting and Repairing Conveyors**

(12.5 Hours)  
Trainee \$20 ISBN 978-0-13-602300-5  
Instructor \$20 ISBN 978-0-13-602302-9  
(Module ID 32502-09) Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors.