L1 MILLWRIGHT

LEVEL 1

Curriculum Notes

- 160 Hours
- Includes 75 hours of Core, which is a prerequisite for Level 1 completion and must be purchased separately. For more information, please refer to page 9 of the full Curriculum Catalog or visit www.nccer.org/catalog.
- Revised: 2021, Fourth Edition
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at www.nccer.org/irc.

PAPERBACK	ISBN
Trainee Guide: $69.99	978-0-13-765382-9

MODULES

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

Introduction to the Millwright Craft *(5 Hours)*
ISBN 978-0-13-765386-7
(Module ID 15101) Presents the history of the trade and discusses career paths for millwrights. Describes environments and types of work associated with the millwright trade.

Millwright Hand Tools *(17.5 Hours)*
ISBN 978-0-13-765387-4
(Module ID 15102) Introduces hand tools used by millwrights. Explains hand tool safety and covers the methods for selecting, inspecting, using, and maintaining these tools.

Fasteners and Anchors *(12.5 Hours)*
ISBN 978-0-13-765394-2
(Module ID 15103) Identifies fasteners and anchors used by millwrights, including their applications and installation procedures.

Basic Layout *(20 Hours)*
ISBN 978-0-13-765399-7
(Module ID 15104) Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

Reading Mechanical Drawings *(20 Hours)*
ISBN 978-0-13-765403-1
(Module ID 15203) Explains orthographic projection, isometric, and schematic drawings used to show piping, hydraulic, and pneumatic systems.

Field Sketching *(10 Hours)*
ISBN 978-0-13-765400-0
(Module ID 15202) Elective - Teaches the basic skills needed to make a good field sketch to convey information about how parts should be made or assembled.

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LEVEL 2

Curriculum Notes

- 175 Hours (required); 37.5 Hours (elective)
- Revised: 2021, Fourth Edition
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at www.nccer.org/irc.

PAPERBACK	ISBN
Trainee Guide: $99.99	978-0-13-765428-4

MODULES

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

Craft-Related Mathematics *(20 Hours)*
ISBN 978-0-13-765434-5
(Module ID 15201) This module introduces the use of equivalents and conversion tables, figure ratios, and proportions. Explains basic use of trigonometry in calculating takeouts, volumes, and weights of objects, and performing right-angle trigonometry.

Precision Measuring Tools *(20 Hours)*
ISBN 978-0-13-765435-2
(Module ID 15302) TExplains how to select, inspect, use, and care for measuring tools of the millwright craft. Now includes tools such as keyseat rules, telescoping gauges, ultrasonic thickness detector and hardness tester.

Millwright Power Tools *(22.5 Hours)*
ISBN 978-0-13-765440-6
(Module ID 15205) Introduces power tools used by millwrights and procedures for using, caring for, and maintaining these tools.

Setting Baseplates and Soleplates *(20 Hours)*
ISBN 978-0-13-765441-3
(Module ID 15207) Describes how to set a machine baseplate and soleplate while guaranteeing alignment with other equipment.

Rigging Practices *(15 Hours)*
ISBN 978-0-13-498801-6
(Module ID 38102) Describes basic rigging and safety practices related to rigging activities. Teaches use and inspection of equipment and hardware used in rigging. Explains how to apply common hitches.

Oxyfuel Cutting *(17.5 Hours)*
ISBN 978-0-13-418268-1
(Module ID 29102) Explains the safety requirements for oxyfuelcutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting,and using the equipment.

Gaskets and Packing *(15 Hours)*
ISBN 978-0-13-765450-5
(Module ID 15107) Describes gaskets and packing and their applications, while also providing instructions for laying out, cutting, and installing gaskets.

O-Rings and Non-Mechanical Seals *(7.5 Hours)*
ISBN 978-0-13-765452-9
(Module ID 15304) Enhanced coverage of dynamic and static seals, including their applications, tools used, installation procedures, and removal. Also covers lip,cup, oil, and labyrinth seals.

Introduction to Bearings *(15 Hours)*
ISBN 978-0-13-765463-5
(Module ID 15209) Describes the types and applications of bearings, including plain, roller, ball, thrust, and guide bearings, as well as pillow block, flanged, and takeup bearings. Also explains bearing designation systems.

Removing and Installing Bearings *(22.5 Hours)*
ISBN 978-0-13-765464-2
(Module ID 15306) Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

Plasma Arc Cutting *(7.5 Hours)*
ISBN 978-0-13-418269-8
(Module ID 29103) Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma-arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

Craft-Related Algebra and Trigonometry *(30 Hours)*
ISBN 978-0-13-765466-6
(Module ID 15301) Explains right-triangle trigonometry and its use in the trade. Also covers interpolation, equilateral and isosceles triangles, and the laws of acute triangles.

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LEVEL 3

Curriculum Notes

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

PAPERBACK	ISBN
Trainee Guide: $99.99	978-0-13-614431-1

MODULES

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

Advanced Trade Math *(20 Hours)*
ISBN 978-0-13-604759-9
(Module ID 15301-08) 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)*
ISBN 978-0-13-604725-4
(Module ID 15302-08) Explains how to select, inspect, use and care for levels, calipers, micrometers, height gauges and surface plates, dial indicators, protractors, parallels and gauge blocks, trammels, and pyrometers.

Installing Packing *(10 Hours)*
ISBN 978-0-13-604732-2
(Module ID 15303-08) Explains the types of packing and packing materials found in a typical stuffing box. Covers how to remove packing and how to install compression packing and lip-type packing.

Installing Seals *(5 Hours)*
ISBN 978-0-13-604727-8
(Module ID 15304-08) Covers the applications, removal, and installation procedures for dynamic and static seals, and lip, cup, oil, and labyrinth seals.

Installing Mechanical Seals *(20 Hours)*
ISBN 978-0-13-604733-9
(Module ID 15305-08) Covers the function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting, and installing mechanical seals.

Removing and Installing Bearings *(20 Hours)*
ISBN 978-0-13-604726-1
(Module ID 15306-08) Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

Couplings *(15 Hours)*
ISBN 978-0-13-604728-5
(Module ID 15307-08) Identifies types of couplings and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

Fabricating Shims *(5 Hours)*
ISBN 978-0-13-604731-5
(Module ID 15308-08) Describes types of shim stock and materials and explains the procedures for fabricating shims.

Alignment Fixtures and Specialty Jigs *(10 Hours)*
ISBN 978-0-13-604769-8
(Module ID 15309-08) Explains the applications and fabrication procedures for angle iron, chain, complex reverse-indicator, Christmas tree, and piano wire jigs.

Prealignment for Equipment Installation *(15 Hours)*
ISBN 978-0-13-604730-8
(Module ID 15310-08) Explains how to level equipment using jack bolts, wedges, and shims. Covers precision leveling procedures and performing clearance installation. Also describes basic steps for setting motors and pumps.

Installing Belt and Chain Drives *(10 Hours)*
ISBN 978-0-13-604770-4
(Module ID 15311-08) Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

Installing Fans and Blowers *(10 Hours)*
ISBN 978-0-13-604771-1
(Module ID 15312-08) Explains how to install axial-flow fans, centrifugal fans, and roots-type and screw-type blowers.

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LEVEL 4

Curriculum Notes

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

PAPERBACK	ISBN
Trainee Guide: $99.99	978-0-13-604506-9

MODULES

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

Conveyors *(5 Hours)*
ISBN 978-0-13-610431-5
(Module ID 15401-08) Describes conveyor systems and their principles of operation.

Troubleshooting and Repairing Conveyors *(12.5 Hours)*
ISBN 978-0-13-610432-2
(Module ID 15402-08) Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors.

Conventional Alignment *(30 Hours)*
ISBN 978-0-13-610433-9
(Module ID 15403-08) Explains the procedures involved in aligning shafts, first with a straightedge and feeler gauges, then with dial indicators.

Pumps *(20 Hours)*
ISBN 978-0-13-610434-6
(Module ID 15404-08) Describes common pumps and their principles of operation. Explains centrifugal, rotary, reciprocating and metering pumps. Describes net positive suction head and cavitation.

Troubleshooting and Repairing Pumps *(7.5 Hours)*
ISBN 978-0-13-610435-3
(Module ID 15405-08) Describes inspecting, troubleshooting, assembling, and disassembling pumps. Explains installing pumps, and preparing them for startup. Discusses shutdown, repair, and removal of pumps from the system.

Compressors and Compressor Maintenance *(20 Hours)*
ISBN 978-0-13-610437-7
(Module ID 15406-08) Introduces compressors and the troubleshooting and maintenance procedures associated with compressors.

Basic Pneumatic Systems *(7.5 Hours)*
ISBN 978-0-13-610438-4
(Module ID 15407-08) Explains pneumatic system components and compressed-air treatment. Introduces equipment auxiliary and special-application equipment used with compressors and with tools.

Troubleshooting and Repairing Pneumatic Equipment *(10 Hours)*
ISBN 978-0-13-610474-2
(Module ID 15408-08) Explains repair and maintenance of pneumatic system components. Describes troubleshooting processes and methods, including pressure sensors and flow sensors.

Basic Hydraulic Systems *(10 Hours)*
ISBN 978-0-13-610475-9
(Module ID 15409-08) Describes principles and types of hydraulic equipment and related safety procedures. Describes applications of hydraulic equipment.

Troubleshooting and Repairing Hydraulic Equipment *(7.5 Hours)*
ISBN 978-0-13-610476-6
(Module ID 15410-08) Explains inspecting hydraulic systems, diagnosing problems, and repairing these systems. Shows how to read hydraulic schematic symbols.

Troubleshooting and Repairing Gearboxes *(20 Hours)*
ISBN 978-0-13-610477-3
(Module ID 15411-08) 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.

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L5 MILLWRIGHT

LEVEL 5

Curriculum Notes

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

PAPERBACK	ISBN
Trainee Guide: $99.99	978-0-13-609960-4

MODULES

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

Reverse Alignment *(30 Hours)*
ISBN 978-0-13-610491-9
(Module ID 15501-09) 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)*
ISBN 978-0-13-610492-6
(Module ID 15502-09) Using one example system, describes the principles of using laser alignment systems to perform alignments.

Advanced Blueprint Reading *(25 Hours)*
ISBN 978-0-13-610494-0
(Module ID 15503-09) Describes the use of drawing sets to obtain information about a system. Explains the process of identifying a part of a machine for repair or replacement from a set of drawings.

Optical Alignment *(25 Hours)*
ISBN 978-0-13-610495-7
(Module ID 15504-09) Explains how to use theodolites, optical levels, auto levels, and total stations to place and align equipment.

Turbines *(20 Hours)*
ISBN 978-0-13-610496-4
(Module ID 15505-09) 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)*
ISBN 978-0-13-610497-1
(Module ID 15506-09) Describes the process of inspecting and repairing key components of turbines. Explains the guidelines for maintaining large steam turbines.

Installing Electric Motors *(10 Hours)*
ISBN 978-0-13-610498-8
(Module ID 15507-09) Describes different types of electric motors, and presents basic guidelines for the installation of motors.

Preventive and Predictive Maintenance *(10 Hours)*
ISBN 978-0-13-610499-5
(Module ID 15508-09) Explains preventive and predictive maintenance programs. Provides information on nondestructive testing, and introduces the basic techniques for NDE. Lubricant analysis, and acoustic, infrared, and vibration testing are also discussed.

Vibration Analysis *(5 Hours)*
ISBN 978-0-13-610465-0
(Module ID 15509-09) Explains the causes of vibration and the procedures and types of equipment used in vibration analysis. Describes the equipment used for vibration testing and monitoring. Describes field machine balancing.