

MILLWRIGHT: Level One

15101-06 Orientation to the Trade (5 Hours)

Explains the history of the trade and discusses the various career paths that can be followed by a millwright. Describes some of the characteristic environments and types of woks to be encountered.

15102-06 Millwright Hand Tools (15 Hours)

Introduces various hand tools used in the millwright trade. Explains basic hand tool safety and covers the methods for selecting, inspecting, using, and maintaining these tools.

15103-06 Fasteners and Anchors (10 Hours)

Identifies the various types of fasteners and anchors used by millwrights, including their applications and installation procedures.

15104-06 Basic Layout (20 Hours)

Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

15105-06 Gaskets and O-Rings (10 Hours)

Describes gaskets and O-rings and their applications. Provides instructions for laying out, cutting, and installing gaskets.

15106-06 Oxyfuel Cutting (15 Hours)

Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Covers straight line cutting, piercing, beveling, washing, and gouging.

MILLWRIGHT: Level Two

15201-07 Intermediate Trade Math (20 Hours)

Explains how to use tables of equivalents and conversion tables, figure ratios and proportions, perform right angle trigonometry, calculate take-outs using trigonometry, and calculate volumes and weights of objects.

15202-07 Field Sketching (10 Hours)

Teaches the basic skills needed to make a good field sketch to convey information about how parts should be made or assembled.

15203-07 Intermediate Blueprint Reading (20 Hours)

Explains orthographic projection, isometric, and schematic drawings used to show piping, hydraulic, and pneumatic systems.

15204-07 Specialty Tools (10 Hours)

Explains how to select, inspect, and maintain torque multipliers, cable cutters, nut splitters, keyseat rules, zero-to-one micrometers, and various gauges.

15205-07 Millwright Power Tools (20 Hours)

Introduces power tools used by millwrights and teaches step-by-step procedures for using, caring for, and maintaining these tools.

15206-07 Rigging (20 Hours)

Explains how to select, inspect and use rigging equipment, how to determine requirements and plans lifts, and how to communicate with crane operators.

15207-07 Setting Baseplates and Soleplates (15 Hours)

Explains procedures for setting machine baseplates and soleplates, and aligning them with other equipment.

15208-07 Lubrication (20 Hours)

Explains how to safely select and use lubricants. Describes the types of lubricants and lubrication devices.

15209-07 Introduction to Bearings (15 Hours)

Describes the types and applications of various types of bearings, including plain, roller, ball, thrust, and guide bearings, as well as pillow block, flanged, and takeup bearings. Also explains bearing designation systems.

MILLWRIGHT: Level Three

15301-08 **Advanced Trade Math (20 Hours)**

Explains right triangle trigonometry and its use in the trade. Also covers interpolation, equilateral and isosceles triangles and the laws of acute triangles.

15302-08 **Precision Measuring Tools (20 Hours)**

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.

15303-08 **Installing Packing (10 Hours)**

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.

15304-08 **Installing Seals (5 Hours)**

Covers the applications, removal, and installation procedures for dynamic and static seals, and lip, cup, oil, and labyrinth seals.

15305-08 **Installing Mechanical Seals (20 Hours)**

Covers function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting, and installing mechanical seals.

15306-08 **Removing and Installing Bearings (20 Hours)**

Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

15307-08 **Couplings (15 Hours)**

Identifies various types of couplings and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

15308-08 **Fabricating Shims (5 Hours)**

Describes types of shim stock and materials and explains the procedures for fabricating shims.

15309-08 **Alignment Fixtures and Specialty Jigs (10 Hours)**

Explains the applications and fabrication procedures for angle iron, chain, complex reverse-indicator, Christmas tree, and piano wire jigs.

15310-08 **Prealignment for Equipment Installation (15 Hours)**

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.

15311-08 **Installing Belt and Chain Drives (10 Hours)**

Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

15312-08 **Installing Fans and Blowers (10 Hours)**

Identifies and explains how to install axial-flow fans, centrifugal fans, and roots-type and screw-type blowers.

MILLWRIGHT: Level Four

15401-08 Conveyors (5 Hours)

Describes the types of conveyor systems and their principles of operation.

15402-08 Troubleshooting and Repairing Conveyors (12.5 Hours)

Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors.

15403-08 Conventional Alignment (30 Hours)

Explains the procedures involved in aligning shafts, first with straight edge and feeler gauges, then with dial indicators.

15404-08 Pumps (20 Hours)

Describes the common types of pumps and their principles of operation. Explains centrifugal, rotary, reciprocating and metering pumps. Also explains net positive suction head and cavitation.

15405-08 Troubleshooting and Repairing Pumps (7.5 Hours)

Describes inspecting, troubleshooting, assembling and disassembling pumps. Explains installing pumps, and preparing them for start-up. Discusses shutdown, repair, and removal of pumps from system.

15406-08 Compressors and Compressor Maintenance (20 Hours)

Describes types of compressors, their principles of maintenance, and troubleshooting and maintenance procedures associated with compressors.

15407-08 Basic Pneumatic Systems (7.5 Hours)

Explains pneumatic systems components and compressed-air treatment. Introduces equipment auxiliary and special-application equipment used with compressors and with tools.

15408-08 Troubleshooting and Repairing Pneumatic Systems (10 Hours)

Explains repair and maintenance of pneumatic system components. Describes troubleshooting process and methods, including pressure sensors and flow sensors.

15409-08 Basic Hydraulic Systems (10 Hours)

Describes principles and types of hydraulic equipment and safety procedures. Describes application of hydraulic equipment.

15410-08 Troubleshooting and Repairing Hydraulic Equipment (7.5 Hours)

Explains inspecting hydraulic system, diagnosing problems, and repairing systems. Shows how to read hydraulic schematic symbols.

15411-08 Troubleshooting and Repairing Gearboxes (20 Hours)

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.

MILLWRIGHT: Level Five

15501-09 Reverse Alignment (30 Hours)

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.

15502-09 Laser Alignment (25 Hours)

Describes alignment with laser alignment systems. Explains the use of one system, and then uses that system to demonstrate alignment principles.

15503-09 Advanced Blueprint Reading (25 Hours)

Describes the use of drawing sets to obtain information about a system. Explains the process of indentifying a part of a machine for repair or replacement from a set of drawings.

15504-09 Optical Alignment (25 Hours)

Explains how to use theodolites, optical levels, auto levels, and total stations to place and align equipment..

15505-09 Turbines (20 Hours)

Describes types of turbines and the components of turbines. Explains the basic operation of turbines, and common applications of particular types, including gas, steam, and water turbines.

15506-09 Maintaining and Repairing Turbine Components (15 Hours)

Describes the process of inspecting and repairing key components of turbines. Explains the guidelines for maintaining large steam turbines.

15507-09 Installing Electric Motors (10 Hours)

Describes different types of electric motors, and presents basic guidelines for the installation of motors.

15508-09 Preventive and Predictive Maintenance (10 Hours)

Explains preventive and predictive maintenance programs. Provides information on nondescriptive testing, and introduces the basic techniques for NDE. Lubricant analysis, and acoustic, infrared, and vibration testing are also discussed.

15509-09 Vibration Analysis (10 Hours)

Explains the causes of vibration and the procedures and types of equipment used in vibration analysis. Describes the kinds of equipment used for vibration testing and monitoring. Describes field machine balancing.