

**Associated Builders & Contractors, Inc. – Central Ohio Chapter  
Millwright Program – NCCER *Content Learning Series***

**MILLWRIGHT: Level One**

**15101-06 Millwright Hand Tools (20 Hours)**

Introduces various hand tools that will be used in the millwright trade. Explains basic hand tool safety and procedures for selecting, inspecting, using, and maintaining the tools.

**15102-06 Fasteners (10 Hours)**

Identifies and explains installation procedures for threaded, non-threaded, and insulation fasteners.

**15103-06 Basic Layout (15 Hours)**

Identifies layout tools and explains how to layout base lines by the arc method and 3-4-5 method.

**15104-06 Cutting and Fitting Gaskets (10 Hours)**

Identifies and describes gaskets and gasket materials. Provides procedures for laying out, cutting, and installing gaskets.

**09101-06 Oxyfuel Cutting (from Welding curricula) (17.5 Hours)**

Covers the set-up and use of equipment and provides procedures for performing various types of oxyfuel cuts.

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**MILLWRIGHT: Level Two**

**15201 Intermediate Trade Math (20 Hours)**

Explains ratios and proportions, solving basic algebra, area, volume, circumference, circular speed problems, and using tables.

**15202 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 Intermediate Blueprint Reading (30 Hours)**

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

**15204 Specialty Tools (10 Hours)**

Explains how to select, inspect, use, and maintain torque multipliers, cable cutters, nut splitters, keyseat rules, precision tales, various gauges, and hardness testers.

**15205 Millwright Power Tools (20 Hours)**

Introduces different types of millwright power tools and teaches step-by-step procedures for selecting, using, caring for, and maintaining these tools.

**15206 Complex and Heavy Rigging (10 Hours)**

Explains how to identify, select, and inspect rigging hardware, read and interpret lifting capacity charts, and understand load balancing and pick points.

**15207 Light Lifting Devices (10 Hours)**

Includes procedures for figuring parts of a line for a block and tackle, and selecting, inspecting, using, and maintaining a block and tackle, chain hoists, come-alongs, jacks, and tuggers.

**15208 Lubrication (20 Hours)**

Explains lubrication safety, storage, classifications, and selecting lubricants, additives, lubrication equipment, and lubricating charts.

**09104 SMAW Equipment and Setup (from Welding curricula) (3 Hours)**

Introduces the trainee to shielded metal arc welding safety, electric welding current, welding machines, and various welding equipment and tools.

**09203 Physical Characteristics and Properties of Metals (from Welding curricula) (3 Hours)**

Identifies the common ferrous and non-ferrous metals, and explains their physical characteristics, mechanical properties, compositions, and classifications.

**15211 Introduction to Bearings (15 Hours)**

Introduces the trainee to plain, ball, roller, thrust, guide, flanged, pillow block, and takeup bearings. Also explains bearing materials and bearing designation.

**MILLWRIGHT: Level Three**

**15301           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           Precision Measuring Tools (25 Hours)**

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.

**15303           Installing 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.

**15304           Prealignment for Drilling and Tapping (25 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.

**15305           Fabrication Shims (5 Hours)**

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

**15306           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-types packing.

**15307           Installing Mechanical Seals (20 Hours)**

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

**15308           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.

**15309           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.

**15310           Installing Fans and Blowers (10 Hours)**

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

**15311           Installing Bearings (20 Hours)**

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

**15312           Installing Seals (5 Hours)**

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

**MILLWRIGHT: Level Four**

**15401           Conveyors (5 Hours)**

Identifies and explains the purposes, operation, and major parts of roller, belt, chain, screw, and pneumatic conveyors. Includes safe working practices.

**15402           Basic Hydraulic Systems (10 Hours)**

Explains hydraulic system safety and basic principles of hydraulics, including Pascal's law and Bernoulli's principle. Explains the function of fluids, parts, pumps, and motors.

**15403           Basic Pneumatic Systems (15 Hours)**

Covers pneumatic safety, characteristics of gases and how they are compressed, pneumatic transmission of energy, and compressor operation.

**15404           Troubleshooting and Repairing Compressors (20 Hours)**

Discusses compressor operation, compressor types, intake filters, inter-coolers and after-coolers, and how to troubleshoot and repair air compressors.

**15405           Vibration Analysis (5 Hours)**

Covers the causes for vibration, vibration monitoring programs, vibration test equipment, and how to field balance machines.

**15406           Setting Baseplates and Soleplates (15 Hours)**

Explains how to establish baseplate and soleplate locations and lay them out, installation procedures, and how to field-verify a plate installation.

**15407           Conventional Alignment (30 Hours)**

Covers types of misalignment, aligning couplings using a straightedge and feeler gauge, adjusting face and OD alignment, using a dial indicator, and eliminating coupling stress.

**15408           Pumps (20 Hours)**

Explains centrifugal, rotary, reciprocating, metering, and vacuum pump operation and installation methods. Also covers net positive suction head and cavitation.

**15409           Troubleshooting and Repairing Pumps (10 Hours)**

Covers how to inspect, troubleshoot, and prepare pumps for shutdown. Includes removing pumps from the system, disassembly, and reassembly procedures.

**15410           Troubleshooting and Repairing Hydraulic Equipment (10 Hours)**

Explains how to inspect, troubleshoot, and repair hydraulic systems and components. Includes exercises on reading system schematic diagrams.

**15411           Troubleshooting and Repairing Gearboxes (20 Hours)**

Explains how to inspect, remove, reassemble, install, and maintain gearboxes. Covers measuring and adjusting backlash and bearing clearance.

**15412           Troubleshooting and Repairing Conveyors (15 Hours)**

Explains how to maintain, troubleshoot, and repair conveyors, including belt splicing and replacing sprockets, bearings, and conveying devices.

**MILLWRIGHT: Level Five**

**15501           Advanced Blueprint Reading (25 Hours)**

Covers reading plant or foundation layouts, assembly and detail drawings, title blocks, and bills of materials. Covers machine drawings and how to locate individual components on a plant layout and assembly drawing.

**15502           Troubleshooting and Repairing Pneumatic Equipment (10 Hours)**

Covers how to perform preventive maintenance, inspect components, and read schematic diagrams. Includes troubleshooting and repair procedures for pneumatic systems.

**15503           Turbines (20 Hours)**

Identifies and explains impulse and reaction turbines, types of turbines, and steam and gas turbine components.

**15504           Troubleshooting and Repairing Turbine Equipment (15 Hours)**

Covers how to inspect, troubleshoot, repair, and maintain turbines and turbine components.

**15505           AC/DC Motor Operation (10 Hours)**

Discusses basic theories of AC and DC electric motors and three-phase systems and motors. Includes trouble-shooting procedures for motors.

**15506           Preventive and Predictive Maintenance (10 Hours)**

Covers nondestructive testing, ultrasonics, radiography, eddy current inspection, magnetic particle inspection, acoustic emissions, infrared testing, vibration analysis, and tribology.

**15507           Performing Reverse Alignment (30 Hours)**

Using the reverse dial indicator method, trainees will identify improper pipe hanger placement, measure shaft runout, set up complex reverse dial indicator jigs, and chart alignment.

**15508           Performing Optical Alignment (25 Hours)**

Explains how to align equipment using a jig transit and level equipment using an optical level. Covers how to use optical squares, alignment telescopes, and metrological bars.

**15509           Performing Laser Alignment (25 Hours)**

Covers the use and operation of laser alignment systems and how to measure shaft sag, perform vertical alignment, and align machinery trains.